FINAL

Noise Study Report

State Route 91 (SR-91) Widening Project (SR-55 to SR-241)

Orange County, CA

12-OC-SR91-PM 9.1/15.6

EA #: 12-0G3300

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Prepared By: _____ Date: 8/11/08

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Summary

This report presents the results of a traffic noise abatement study conducted for the north and south sides of State Route 91 (SR-91) from State Route 55 (SR-55) to State Route 241 (SR-241) in the Anaheim Hills region of the City of Anaheim, California. SR-91 in the subject project area is proposed to be improved by the addition of one GP lane to both directions from SR-55 (PM 9.1) to SR-241 (PM 15.6) with the exception of the westbound portion of the project between Imperial Highway and SR-55, where no additional lane would be added, and the eastbound and westbound portions of the project between Imperial Highway and the Weigh Station located approximately 0.7 miles west of Weir Canyon Road, where two additional lanes in each direction would be added. The three interchanges within the project limits are Lakeview Avenue (PM 10.1), Imperial Highway (PM 11.5), and Weir Canyon Road (PM 14.4). The auxiliary lanes, which would be removed due to the lane addition, would be restored in kind. The existing mainline and freeway ramps would be reconstructed according to California Department of Transportation (Department) standards. However, the freeway ramps would be reconstructed and improved (i.e., two lanes rather than the existing one lane) from and to the mainline and would tie into the existing ramps only at the intersections with the local streets and highways.

The project alternatives consist of the project as described above and the No-Project Alternative. Under the No-Project Alternative, the existing roadway configuration would remain and continue to be utilized in the existing configuration. No project-related construction modifications would take place.

The land uses in the project area consist of residential, recreational (parks and school athletic fields), transient lodging (hotels), and commercial. None of the adjacent commercial land uses were found have outdoor break or eating areas facing the freeway. Similarly, none of the area's hotels had recreation or other rest areas facing the freeway. Additionally, it was found that no school classrooms or other structures associated with the schools were close enough to SR-91 to warrant interior noise measurements.

The terrain in the project area is relatively flat. Surrounding land uses are generally several feet below grade (relative to SR-91) on the north side and either above grade or approximately at-grade on the south side. As part of the traffic noise abatement study, 28 short-term (10-minute) and nine long-term (24-hour or longer) noise measurement sets were conducted at locations representative of noise-sensitive land uses (i.e., residences, school athletic fields, parks, the nearest commercial use, and hotels). The measured noise

levels were adjusted to the corresponding peak-noise-hour level using the long-term noise data. Existing peak-hour noise levels were found to range from 56 dBA $L_{eq(H)}$ to 73 dBA $L_{eq(H)}$ for residential land uses; 56 dBA $L_{eq(H)}$ to 70 dBA $L_{eq(H)}$ for school athletic fields, parks, and RV uses; 54 dBA $L_{eq(H)}$ (poolside, behind the hotel) to 73 dBA $L_{eq(H)}$ (exterior facade) for hotels; and approximately 70 dBA $L_{eq(H)}$ for the nearest commercial land uses.

Existing, design year no-project, and design year with-project alternative noise levels were modeled using Traffic Noise Model (TNM) version 2.5. Future with-project peak-hour noise levels are predicted to range from 57 dBA $L_{eq(H)}$ to 75 dBA $L_{eq(H)}$ for residential land uses; 55 dBA $L_{eq(H)}$ to 70 dBA $L_{eq(H)}$ for school athletic fields, parks, and RV uses; 69 dBA $L_{eq(H)}$ to 74 dBA $L_{eq(H)}$ (exterior facade) for hotels; and 70 dBA $L_{eq(H)}$ for the nearest commercial land uses.

Based upon the results of the traffic noise analysis, it was found that 33 of the 109 modeled residential receptors (representative of approximately 283residences) would approach or exceed the FHWA/Department Noise Abatement Criteria (NAC) for Activity Category B land uses with construction of the project. It was also determined that 6 of the 8 modeled recreational receptors (representative of approximately 35 residential equivalents, calculated using the ratio of 1 residential equivalent per 100 foot of frontage) would approach or exceed the NAC for Activity Category B land uses, and that none of the modeled transient lodging receptors would approach or exceed the interior NAC for Activity Category E. The nearest commercial land use was found to not approach or exceed the NAC for Activity Category C.

Noise Abatement. Noise abatement in the form of noise barriers was considered for the land uses that were found to approach or exceed the NAC for the existing, future with-project, and future without-project noise levels. Specifically, noise abatement was considered for residential land uses in Areas A, C, F, and H. Noise abatement was also considered for residential as well as recreational land uses in Area D, and for recreational/RV land uses in Area G. The noise barriers for which abatement was considered are shown in Appendix B (Figures B-1 through B-26), and the noise barriers for which abatement was found to be feasible are shown in Figures 7-1 through 7-11 .

In Area A, in which an existing, 14-foot-high edge-of-shoulder noise barrier exists, abatement in the form of potentially increasing the noise barrier height to 16 feet (NB-1), and constructing an extension of NB-1 on the eastern end (NB-1 Ext) ranging in height from 6 feet to 16 feet (in 2-foot increments) was analyzed (shown in Figures B-1through B-6). It was found that an increase of NB-1 to 16 feet in height would not be feasible to

construct based upon insufficient insertion loss, as well as height limitations because of proximity to the travel lanes. The extension would be approximately 345 feet long and would be feasible to construct, providing a 5-dB or greater benefit and breaking the truck stack line-of-sight to an estimated 2 residential receivers at a minimum barrier height of 14 feet.

In Area C, which contains an existing edge-of-shoulder noise barrier 14 feet high and an existing right-of-way noise barrier 10 feet high (along the Lakeview Avenue westbound off-ramp), abatement in the form of potentially increasing the height of the edge-of-shoulder and right-of-way noise barriers (NB-2A and NB-2B) to 16 feet was analyzed (shown in Figures B-5 through B-9). It was found that increasing NB-2A and NB-2B to 16 feet high would not be feasible to construct based upon insufficient insertion loss (i.e., less than 5 dB) at the residential receptors as well as height limitations in the case of NB-2A because of proximity to the travel lanes.

In Area D, which contains an existing right-of-way noise barrier 14 feet high, abatement in the form of potentially increasing the noise barrier height to 16 feet (NB-3) and constructing an extension of NB-3 on the western end (NB-3Ext W) ranging in height from 6 feet to 16 feet (in 2-foot increments) was analyzed (shown in Figures B-5 and B-7 through B-12). It was found that an increase of NB-3 to 16 feet in height would not be feasible to construct based upon insufficient insertion loss at the residential and recreational/ athletic field receptors. The extension (NB-3 Ext W) would be approximately 80 feet long and would be feasible to construct, providing a 5-dB or greater benefit and breaking the truck stack line-of-sight to 1 residential receiver at a minimum barrier height of 10 feet.

In Area F, the residences near the west end of the area have developer-constructed noise barriers 14 feet high, and the residences to the east have developer-constructed walls with a nominal height of 6 feet atop an earthen berm that varies in height from approximately 1 foot on the west side to approximately 6 feet on the east side. Abatement for the residences in Area F was analyzed in the form of potentially constructing a noise barrier along the edge-of-shoulder (NB-4), right-of-way (NB-5), 6 feet inside the Department property line (NB-7), at the right-of-way with the barrier base elevation increased to the equivalent height of the adjacent berm elevation (NB-8), and extending existing wall heights at the residential property line (NB-6) (shown in Figures B-12 through B-20). The barrier heights analyzed were from 6 feet to 16 feet high in 2-foot increments. The analysis indicates that:

- an edge-of-shoulder noise barrier (NB-4) with a minimum height of 12 feet would be feasible to construct, benefitting an estimated 3 (with a 12-foot high barrier) to 129 (with a 16-foot high barrier) residential receptors;
- a right-of-way noise barrier (NB-5) with a minimum height of 14 feet would be feasible to construct, benefitting an estimated 17 (with a 14-foot high barrier) to 47 (with a 16-foot high barrier) residential receptors;
- a residential property-line (i.e., at the existing "garden wall" location) noise barrier (NB-6) with a minimum height of 10 feet would be feasible to construct, benefitting an estimated 12 (with a 10-foot high barrier) to 61 (with a 16-foot high barrier) residential receptors;
- a noise barrier constructed 6 feet inside the right-of-way (NB-7) with a minimum height of 14 feet would be feasible to construct, benefitting an estimated 17 (with a 14-foot high barrier) to 42(with a 16-foot high barrier) residential receptors; and
- a noise barrier constructed at the Department right-of-way with the barrier base elevation increased to the equivalent height of the adjacent berm elevation (NB-8) with a minimum height of 10 feet would be feasible to construct, benefitting an estimated 66 (with a 10-foot high barrier) to 105 (with a 16-foot high barrier) residential receptors.

In Area G, the RV campground/recreation area has an existing 12-foot high noise barrier along the edge-of-shoulder for most but not all of its frontage with the SR-91. Noise abatement for these land uses was considered in the form of a new edge-of-shoulder noise barrier (ranging from 6 feet to 16 feet in 2-foot increments) at the western edge of the RV campground/recreational area (NB-9A) and an increase in height (to a maximum of 16 feet) of the existing noise barrier (NB-9B) (shown in Figures B-25 and B-26). It was found that construction of NB-9A and an increase in height of NB-9B would not be feasible because of insufficient insertion loss.

In Area H, abatement was considered for the apartment complex that overlooks SR-91 east of Weir Canyon Road. Construction of noise barriers at the edge-of-shoulder (NB-10), right-of-way (NB-12), and the residential property line (NB-14) was analyzed in 2-foot increments from 6 feet to 16 feet (shown in Figures B-22 through B-26). The analysis indicates that:

- an edge-of-shoulder noise barrier (NB-10) with a minimum height of 12 feet would be feasible to construct, benefitting an estimated 24 (with a 12-foot high barrier) to 56 (with a 16-foot high barrier) residential receptors;
- a right-of-way noise barrier (NB-12) would not be feasible because of insufficient insertion loss/truck-stack line-of-sight height; and
- a 6-, 8-, 10-, 12-, 14- or 16-foot residential property-line noise barrier (NB-14) would benefit an estimated 56 residential receptors.

Additionally, abatement was considered for the single-family residence located near the southwest quadrant of the SR-91/SR-241 interchange. Construction of noise barriers at the edge-of-shoulder (NB-11), right-of-way (NB-13), and the residential property line (NB-15) was analyzed in 2-foot increments from 6 feet to 16 feet. The analysis indicates that:

- a 6-, 8-, 10-, 12-, 14- or 16-foot edge-of-shoulder noise barrier (NB-11) would benefit 1 residential receptor;
- a 6-, 8-, 10-, 12-, 14- or 16-foot right-of-way noise barrier (NB-13) would benefit 1 residential receptor; and
- a 14- or 16-foot residential property-line noise barrier (NB-15) would benefit 1 residential receptor.

Reasonableness allowances (per residence and total) were calculated for the noise-impacted areas for which noise barriers were found to be acoustically feasible, using the methodology as outlined in the Caltrans Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects (August 2006). The reasonableness allowance data is to be used as part of the subsequent determination of the overall reasonableness of noise abatement, which is accomplished in the Noise Abatement Decision Report (NADR). The reasonableness allowance data is summarized in Chapter 7 of this document.

During construction of the project, noise from construction activities may intermittently dominate the noise environment in the immediate area of construction. Construction equipment is expected to generate noise levels ranging from 70 to 90 dB at a distance of 50 feet, and noise produced by construction equipment would diminish over distance at a rate of about 6 dB per doubling of distance. No adverse noise impacts from construction are anticipated because construction would be conducted in accordance with Department Standard Specifications Section 7-1.01I and applicable local noise standards. Further,

implementing the measures specified in Chapter 8 of this report would minimize the temporary noise impacts from construction.

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List of Abbreviated Terms

CFR	Code of Federal Regulations
CNEL	Community Noise Equivalent Level
dB	decibels
EB	eastbound
FHWA	Federal Highway Administration
GP	general purpose
HDM	Highway Design Manual
Hz	Hertz
kHz	kilohertz
L_{dn}	Day-Night Level
L_{eq}	Equivalent Sound Level
L_{max}	Maximum Sound Level
LOS	Level of Service
L_{xx}	Percentile-Exceeded Sound Level
mPa	micro-Pascals
mph	miles per hour
NAC	noise abatement criteria
NADR	Noise Abatement Decision Report
NB	northbound
NCCP	Natural Communities Conservation Program
NSR	noise study reports
PeMS	Performance Measurement System
Protocol	Caltrans Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects
SB	southbound
SPL	sound pressure level
SR-90	Imperial Highway
SR-91	State Route 91
TDM	Transportation Demand Management
TeNS	Caltrans' Technical Noise Supplement
TNM 2.5	FHWA Traffic Noise Model Version 2.5
TSM	Transportation System Management
vphpl	vehicles per hour per lane
WB	westbound

Chapter 1. Introduction

1.1. Purpose of the Noise Study Report

The purpose of this NSR is to evaluate noise impacts and abatement under the requirements of Title 23, Part 772 of the Code of Federal Regulations (23 CFR 772) "Procedures for Abatement of Highway Traffic Noise." 23 CFR 772 provides procedures for preparing operational and construction noise studies and evaluating noise abatement considered for federal and federal-aid highway projects. According to 23 CFR 772.3, all highway projects that are developed in conformance with this regulation are deemed to be in conformance with Federal Highway Administration (FHWA) noise standards.

The California Department of Transportation (Department) *Traffic Noise Analysis Protocol,* dated August 2006 (protocol) provides the Department's policy for implementing 23 CFR 772 in California. The protocol outlines the requirements for preparing noise study reports (NSR).

1.2. Project Purpose and Need

State Route 91 (SR-91) is the primary transportation corridor between Orange County and nearby Riverside County. It is also a major link connecting the greater Los Angeles region with the Inland Empire (Riverside/San Bernardino Counties) and is therefore a key link in the interstate traffic network.

Within the project area (east of SR-55 and west of SR-241), SR-91 currently has four to five general purpose (GP) lanes and two toll lanes in each direction.

The purpose of the project is to relieve congestion and improve operational efficiency on SR-91 between SR-55 and SR-241.

Increasing traffic on the SR-91 corridor has seriously degraded the freeway level of service, particularly during the extended commuter hours. Specific operational deficiencies include the following:

1. SR-55 northbound (NB) drops one GP lane at north of the junction with EB SR-91. The combined EB SR-91 roadway consists of six lanes, one of which becomes an auxiliary lane as a single lane exit-only ramp to Lakeview Avenue. This creates an extremely difficult weave for EB SR-91 traffic exiting at Lakeview Avenue, and seriously compromises lane efficiency at the ramp junction.

2. Lane efficiency problems are experienced when GP lane 5 becomes an EB auxiliary lane to Imperial Highway. The impact on traffic operations is made worse in this area because the on-ramp from Lakeview Avenue merge with GP lane 5.
3. The EB auxiliary lane from the Weigh Station becomes a single lane exit-only ramp to Weir Canyon Road, resulting in a queuing problem.
4. The EB auxiliary lane from the Weigh Station becomes a single lane exit-only ramp to Weir Canyon Road, resulting in a queuing problem.
5. GP lane 5 WB from SR-241 becomes a single lane exit-only ramp to Weir Canyon Road, resulting in a queuing problem.
6. Substantial queuing occurs during the commuter peak hours WB at SR-91/SR-55 Interchange.

In addition to the issues identified above, the following existing non-standard features are found within the project limits:

1. Some existing travel lanes are 11 feet in width instead of the standard width of 12 feet between Imperial Highway and Weigh Station.
2. The existing EB outside shoulder is 2 feet in width (instead of the standard width of 10 feet) from the Weigh Station to the EB exit ramp to Weir Canyon Road.

The project would satisfy the following requirements:

1. All existing traffic lanes shall be maintained during construction.
2. Toll lane operation shall be unaffected.
3. Improvements shall be accommodated within the existing right-of-way to the extent feasible.
4. Cost shall be minimized through the retention of existing facilities to the extent feasible.

Chapter 2. Project Description

The project area lies within the northeastern portion of the City of Anaheim and the southeastern portion of the City of Yorba Linda. There are two parallel arterial roadway corridors, La Palma Avenue and Santa Ana Canyon Road, within the project limits that are currently being utilized in lieu of the SR-91 freeway. The Featherly Regional Park, the Santa Ana River, and the Santa Ana River Trail border the north side of SR-91. To the south, the area is predominantly bordered by Peralta Canyon Park and portions of a natural communities conservation program (NCCP) area.

SR-91 is a major east-west freeway that is located in Southern California, extending from Interstate 110 in the City of Gardena in Los Angeles County east through Orange County, where it intersects Interstates 710, 605, and 5, and State Routes 57, 55, and 241. SR-91 extends further northeast beyond the project limits to the City of Riverside in Riverside County.

The SR-91 was originally constructed in the 1960s as a controlled access freeway. A significant reconstruction effort began in 1992 with the construction of the toll lanes and the SR-241 toll road. Within the study area, SR-91 is generally an 8–10 GP lane freeway with auxiliary lanes. The 91 Express Lanes Toll Road provides two additional lanes in each direction. The toll lanes were built as a private facility but are now owned and operated under OCTA.

The proposed project would add one GP lane to both directions of SR-91 from SR-55 (PM 9.1) to SR-241 (PM 15.6) with the exception of the westbound portion of the project, between Imperial Highway and the SR-55, where no additional lane would be added, and the eastbound and westbound portions of the project between Imperial Highway and the Weigh Station located approximately 0.7 miles west of Weir Canyon Road, where two additional lanes in each direction would be added. The three interchanges within the project limits are Lakeview Avenue (PM 10.1), Imperial Highway (PM 11.5), and Weir Canyon Road (PM 14.4). The auxiliary lanes, which would be removed due to the lane addition, would be restored in kind. The existing mainline and freeway ramps would be reconstructed according to Department standards.

2.1. Alternatives

This section describes the proposed action and the design alternatives that were developed under a multidisciplinary team to achieve the project purpose and need while

avoiding or minimizing environmental impacts. The proposed project would add one GP lane to both directions of SR-91 from SR-55 (PM 9.1) to SR-241 (PM 15.6).

2.1.1. Alternatives Under Consideration

This section describes the project alternatives that were developed in consultation with local agencies as well as with public input through the scoping process and public workshops. The alternatives are the No Build Alternative and the Build Alternative.

2.1.1.1. PROPOSED BUILD ALTERNATIVE

The Build Alternative would improve capacity and remedy operational deficiencies on SR-91 by adding one GP lane in each direction between SR-55 and SR-241, with the exception of the westbound portion of the project between Imperial Highway and SR-55, and the westbound and eastbound portion of the project between Imperial Highway and the Weigh Station, where two lanes in each direction would be added. In general, all existing auxiliary lanes displaced by the addition of this GP lane would be replaced.

The new mainline geometrics would also comply with the Department Highway Design Manual (HDM) standards, and all existing nonstandard-width lanes of 11 feet would be widened to a standard width of 12 feet. Existing GP lanes from the 91 Express Lanes Toll Road buffer edge, including the new GP lane and any auxiliary lane, would have a 12-foot width and a 10-foot outside shoulder width.

Reconstructed on- and off-ramps, from and to the mainline, would tie to the existing ramps at the termini. Ramps would be 12 feet or wider for truck travel lanes, and 4 feet and 8 feet for left and right shoulders, respectively. The capital cost for this alternative is estimated at $72 million.

Eastbound

From the SR-91/SR-55 interchange to Lakeview Avenue off-ramp: Currently, this area of eastbound SR-91 has five GP lanes and one auxiliary lane that exits at Lakeview Avenue. This alternative would add one EB GP lane originating from the SR-91/SR-55 interchange. The GP lane would continue, while the auxiliary lane would exit at Lakeview Avenue. This would provide a two-lane off-ramp exiting to Lakeview Avenue to alleviate the existing traffic congestion during the peak hours.

The loop entrance ramp at Lakeview Avenue would merge to Lane 6. The tangent on-ramp would also merge to lane 6. From there, this alternative would continue six lanes (five GP and one auxiliary) EB to the SR-90/91 Separation (Imperial Highway Overcrossing).

The existing interchange spacing between SR 91/55 Interchange to the Lakeview Avenue Overcrossing is 0.8 mile (with a Design Exception), whereas the minimum required spacing between interchanges is 1 mile in urban areas and 2 miles in rural areas. The elimination of the existing lane drop at the SR 91/55 Interchange would improve traffic operations by having a dedicated lane to the Lakeview Avenue off-ramp.

From Lakeview Avenue to the SR-90/91 Separation (Imperial Highway Overcrossing): Currently, there are four existing GP lanes and an auxiliary lane within this portion of the project. The proposed EB GP lane 5 would extend the existing auxiliary lane (that currently exits to Lakeview Avenue) to the Imperial Highway/SR-90/91 Separation (Imperial Highway Overcrossing). This provides a two-lane off-ramp to Imperial Highway.

From the SR-90/91 Separation (Imperial Highway Overcrossing) off-ramp to Weir Canyon Road on-ramp: There are four existing GP lanes. The new EB GP lane 5 continues on from Imperial Highway to the Weir Canyon Interchange.

The EB loop entrance ramp would have a taper-type entrance to the GP lane 5. The tangent on-ramp would introduce an auxiliary lane that would continue to the Weigh Station.

All nonstandard width lanes of 11 feet would be widened to a standard width of 12 feet. Existing GP lanes from the 91 Express Toll Lanes buffer edge, including the new GP lane and the auxiliary lane, would have a 12-foot-wide lanes and a 10-foot-wide right shoulder.

The auxiliary lane from Imperial Highway leads to a two-lane exit at the Weigh Station. Due to the number of the slow-moving trucks entering the Weigh Station, traffic frequently backs up at this location. The proposed project would widen the Weigh Station off-ramp to two lanes. Providing a two-lane off-ramp at the Weigh Station would improve traffic flow on SR-91 within this portion of the project limits.

The entrance ramp from the Weigh Station introduces an auxiliary lane, which drops as a two-lane off-ramp to Weir Canyon Road. This additional lane would improve the traffic delay caused by high traffic volumes and the existing short weaving distance at this location

From Weir Canyon Road on-ramp to west of the SR-91/241 Interchange: There are four GP lanes and an auxiliary lane from the Weir Canyon tangent on-ramp to the SR-241

east-to-south connector. The addition of EB GP lane 5 would provide a two-lane off-ramp to the SR-241 connector.

Westbound

From west of the SR-91/241 Interchange to Weir Canyon Road off-ramp: There are four existing GP lanes and one auxiliary lane. The existing WB auxiliary lane from the north-to-west SR-241 connector drops off to Weir Canyon Road as a one-lane off-ramp. Due to high traffic volume exiting at Weir Canyon, a two-lane off-ramp is proposed to exit to Weir Canyon. Therefore, the additional GP lane 5 is extended from the SR-241 connector to Weir Canyon Road to provide five lanes continuing through the interchange.

From Weir Canyon Road off-ramp to SR-90 on-ramp: The Weir Canyon Road WB loop on-ramp would have a taper-type entrance to GP lane 5. The tangent on-ramp would introduce an auxiliary lane that would continue together with 5 GP lanes WB, to the Weigh Station. The auxiliary lane from the Weir Canyon Road tangent on-ramp would be dropped into a one-lane exit to the Weigh Station.

There are four existing WB GP lanes from the on-ramp at the Weigh Station to the Imperial Highway. The added GP lane 5 would require some slope modification. The on-ramp from the Weigh Station would be modified to a two-lane entrance ramp that would introduce an auxiliary lane that would continue, together with five WB GP lanes, to Imperial Highway. The auxiliary lane from the Weigh Station on-ramp would be dropped into a two-lane off-ramp to Imperial Highway. From that point, the freeway would extend to five WB GP lanes to the Imperial Highway on-ramps and joint the existing GP lane 5.

From the Imperial Highway on-ramp to SR-91/SR-55 interchange: There are five existing GP lanes from the Imperial Highway on-ramps to the SR-91/SR-55 interchange. Therefore, no additional lane is provided. The existing tangent on-ramp would be modified to a two-lane entrance that would merge to the existing GP lane 5.

The additional widening for GP lane 5 would impact the existing Imperial Highway loop on-ramp. This ramp would be realigned and would include a new CHP enforcement area merging into GP lane 5

2.1.1.2. NO BUILD ALTERNATIVE

The No Build Alternative would not include any improvements to the project and would maintain its existing conditions for the mainline and intersections. SR-91 would continue to operate at LOS E and F during peak hours, resulting in significant delays. This alternative does not address the capacity and operational needs of SR-91, and it is

expected that between now and 2035, traffic congestion would continue to worsen if no freeway operational improvements are implemented within and downstream of the project area.

Chapter 3. Fundamentals of Traffic Noise

The following is a brief discussion of fundamental traffic noise concepts. For a detailed discussion, please refer to the Department's Technical Noise Supplement (TeNS) (Department 1998), a technical supplement to the Protocol that is available on the Department's website (<http://www.dot.ca.gov/hq/env/noise/pub/tens_complete.pdf>).

3.1. Sound, Noise, and Acoustics

Sound can be described as the mechanical energy of a vibrating object transmitted by pressure waves through a liquid or gaseous medium (e.g., air) to a hearing organ, such as a human ear. Noise is defined as loud, unexpected, or annoying sound.

In the science of acoustics, the fundamental model consists of a sound (or noise) source, a receiver, and the propagation path between the two. The loudness of the noise source and obstructions or atmospheric factors affecting the propagation path to the receiver determine the sound level and characteristics of the noise perceived by the receiver. The field of acoustics deals primarily with the propagation and control of sound.

3.2. Frequency, Sound Pressure Levels, and Decibels

Continuous sound can be described by frequency (pitch) and amplitude (loudness). A low-frequency sound is perceived as low in pitch. Frequency is expressed in terms of cycles per second, or hertz (Hz) (e.g., a frequency of 250 cycles per second is referred to as 250 Hz). High frequencies are sometimes more conveniently expressed in kilohertz (kHz), or thousands of Hertz. The audible frequency range for humans is generally between 20 Hz and 20,000 Hz.

The amplitude of pressure waves generated by a sound source determines the loudness of that source. Sound pressure amplitude is measured in micro-Pascals (mPa). One mPa is approximately one hundred billionth (0.00000000001) of normal atmospheric pressure. Sound pressure amplitudes for different kinds of noise environments can range from less than 100 to 100,000,000 mPa. Because of this huge range of values, sound is rarely expressed in terms of mPa. Instead, a logarithmic scale is used to describe sound pressure level (SPL) in terms of decibels (dB). The threshold of hearing for young people is about 0 dB, which corresponds to 20 mPa.

3.3. Addition of Decibels

Because decibels are logarithmic units, SPL cannot be added or subtracted through ordinary arithmetic. Under the decibel scale, a doubling of sound energy corresponds to a 3-dB increase. In other words, when two identical sources are each producing sound of the same loudness, the resulting sound level at a given distance would be 3 dB higher than one source under the same conditions. For example, if one automobile produces an SPL of 70 dB when it passes an observer, two cars passing simultaneously would not produce 140 dB—rather, they would combine to produce 73 dB. Under the decibel scale, three sources of equal loudness together produce a sound level 5 dB louder than one source.

3.4. A-Weighted Decibels

The decibel scale alone does not adequately characterize how humans perceive noise. The dominant frequencies of a sound have a substantial effect on the human response to that sound. Although the intensity (energy per unit area) of the sound is a purely physical quantity, the loudness or human response is determined by the characteristics of the human ear.

Human hearing is limited in the range of audible frequencies as well as in the way it perceives the SPL in that range. In general, people are most sensitive to the frequency range of 1,000–8,000 Hz, and perceive sounds within that range better than sounds of the same amplitude in higher or lower frequencies. To approximate the response of the human ear, sound levels of individual frequency bands are weighted, depending on the human sensitivity to those frequencies. Then, an *A-weighted* sound level (expressed in units of dBA) can be computed based on this information.

The A-weighting network approximates the frequency response of the average young ear when listening to most ordinary sounds. When people make judgments of the relative loudness or annoyance of a sound, their judgments correlate well with the A-scale sound levels of those sounds. Other weighting networks have been devised to address high noise levels or other special problems (e.g., B-, C-, and D-scales), but these scales are rarely used in conjunction with highway-traffic noise. Noise levels for traffic noise reports are typically reported in terms of dBA. Table 3-1 describes typical A-weighted noise levels for various noise sources.

Table 3-1. Typical A-Weighted Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	— 110 —	Rock band
Jet fly-over at 1000 feet		
	— 100 —	
Gas lawn mower at 3 feet		
	— 90 —	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	— 80 —	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawn mower, 100 feet	— 70 —	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	— 60 —	
		Large business office
Quiet urban daytime	— 50 —	Dishwasher next room
Quiet urban nighttime	— 40 —	Theater, large conference room (background)
Quiet suburban nighttime		
	— 30 —	Library
Quiet rural nighttime		Bedroom at night, concert
	— 20 —	
		Broadcast/recording studio
	— 10 —	
Lowest threshold of human hearing	— 0 —	Lowest threshold of human hearing
Source: Department 1998.		

3.5. Human Response to Changes in Noise Levels

As discussed above, doubling sound energy results in a 3-dB increase in sound. However, given a sound level change measured with precise instrumentation, the subjective human perception of a doubling of loudness will usually be different than what is measured.

Under controlled conditions in an acoustical laboratory, the trained, healthy human ear is able to discern 1-dB changes in sound levels, when exposed to steady, single-frequency

(pure-tone) signals in the midfrequency (1,000 Hz–8,000 Hz) range. In typical noisy environments, changes in noise of 1 to 2 dB are generally not perceptible. However, it is widely accepted that people are able to begin to detect sound level increases of 3 dB in typical noisy environments. Further, a 5-dB increase is generally perceived as a distinctly noticeable increase, and a 10-dB increase is generally perceived as a doubling of loudness. Therefore, a doubling of sound energy (e.g., doubling the volume of traffic on a highway), which would result in a 3-dB increase in sound, would generally be perceived as barely detectable.

3.6. Noise Descriptors

Noise in our daily environment fluctuates over time. Various noise descriptors have been developed to describe time-varying noise levels. The following are the noise descriptors most commonly used in traffic noise analysis.

- Equivalent Sound Level (L_{eq}): L_{eq} represents an average of the sound energy occurring over a specified period. In effect, L_{eq} is the steady-state sound level containing the same acoustical energy as the time-varying sound that actually occurs during the same period. The 1-hour A-weighted equivalent sound level ($L_{eq}[h]$) is the energy average of A-weighted sound levels occurring during a one-hour period, and it is the basis for noise abatement criteria (NAC) used by the Department and FHWA.

- Percentile-Exceeded Sound Level (L_{xx}): L_{xx} represents the sound level exceeded for a given percentage of a specified period (e.g., L_{10} is the sound level exceeded 10% of the time, and L_{90} is the sound level exceeded 90% of the time).

- Maximum Sound Level (L_{max}): L_{max} is the highest instantaneous sound level measured during a specified period.

- Day-Night Level (L_{dn}): L_{dn} is the energy average of A-weighted sound levels occurring over a 24-hour period, with a 10-dB penalty applied to A-weighted sound levels occurring during nighttime hours between 10 p.m. and 7 a.m.

- Community Noise Equivalent Level (CNEL): Similar to L_{dn}, CNEL is the energy average of the A-weighted sound levels occurring over a 24-hour period, with a 10-dB penalty applied to A-weighted sound levels occurring during the nighttime hours between 10 p.m. and 7 a.m., and a 5-dB penalty applied to the A-weighted sound levels occurring during evening hours between 7 p.m. and 10 p.m.

3.7. Sound Propagation

When sound propagates over a distance, it changes in level and frequency content. The manner in which noise reduces with distance depends on the following factors.

3.7.1. Geometric Spreading

Sound from a localized source (i.e., a point source) propagates uniformly outward in a spherical pattern. The sound level attenuates (or decreases) at a rate of 6 decibels for each doubling of distance from a point source. Highways consist of several localized noise sources on a defined path, and hence can be treated as a line source, which approximates the effect of several point sources. Noise from a line source propagates outward in a cylindrical pattern, often referred to as cylindrical spreading. Sound levels attenuate at a rate of 3 decibels for each doubling of distance from a line source.

3.7.2. Ground Absorption

The propagation path of noise from a highway to a receiver is usually very close to the ground. Noise attenuation from ground absorption and reflective-wave canceling adds to the attenuation associated with geometric spreading. Traditionally, the excess attenuation has also been expressed in terms of attenuation per doubling of distance. This approximation is usually sufficiently accurate for distances of less than 200 feet. For acoustically hard sites (i.e., sites with a reflective surface between the source and the receiver, such as a parking lot or body of water,), no excess ground attenuation is assumed. For acoustically absorptive or soft sites (i.e., soft dirt, grass, or scattered bushes and trees), an excess ground-attenuation value of 1.5 decibels per doubling of distance is normally assumed. When added to the cylindrical spreading, the excess ground attenuation results in an overall drop-off rate of 4.5 decibels per doubling of distance.

3.7.3. Atmospheric Effects

Receptors located downwind from a source can be exposed to increased noise levels relative to calm conditions, whereas locations upwind can have lowered noise levels. Sound levels can be increased at large distances (e.g., more than 500 feet) from the highway due to atmospheric temperature inversion (i.e., increasing temperature with elevation). Other factors such as air temperature, humidity, and turbulence can also have significant effects.

3.7.4. Shielding by Natural or Human-Made Features

A large object or barrier in the path between a noise source and a receiver can substantially attenuate noise levels at the receiver. The amount of attenuation provided by shielding depends on the size of the object and the frequency content of the noise

source. Natural terrain features (e.g., hills and dense woods) and human-made features (e.g., buildings and walls) can substantially reduce noise levels. Walls are often constructed between a source and a receiver specifically to reduce noise. A barrier that breaks the line of sight between a source and a receiver will typically result in at least 5 dB of noise reduction. Taller barriers provide increased noise reduction. Vegetation between the highway and receiver is rarely effective in reducing noise because it does not create a solid barrier.

Chapter 4. Federal Regulations and State Policies

This report focuses on the requirements of 23 CFR 772, as discussed below.

4.1. Federal Regulations

4.1.1. 23 CFR 772

23 CFR 772 provides procedures for preparing operational and construction noise studies and evaluating noise abatement considered for federal and federal-aid highway projects. Under 23 CFR 772.7, projects are categorized as Type I or Type II projects. FHWA defines a Type I project as a proposed federal or federal-aid highway project for the construction of a highway on a new location, the physical alteration of an existing highway that significantly changes either the horizontal or vertical alignment, or an increase in the number of through-traffic lanes. A Type II project is a noise barrier retrofit project that involves no changes to highway capacity or alignment.

Type I projects include those that create a completely new noise source, as well as those that increase the volume or speed of traffic or move the traffic closer to a receiver. Type I projects include the addition of an interchange, ramp, auxiliary lane, or truck-climbing lane to an existing highway, or widening an existing ramp by a full lane width for its entire length. Projects unrelated to increased noise levels, such as striping, lighting, signing, and landscaping projects, are not considered Type I projects.

Under 23 CFR 772.11, noise abatement must be considered for Type I projects if the project is predicted to result in a traffic noise impact. In such cases, 23 CFR 772 requires that the project sponsor consider noise abatement before adoption of the final NEPA document. This process involves identification of noise abatement measures that are reasonable, feasible, and likely to be incorporated into the project, and of noise impacts for which no apparent solution is available.

Traffic noise impacts, as defined in 23 CFR 772.5, occur when the predicted noise level in the design year approaches or exceeds the NAC specified in 23 CFR 772, or a predicted noise level substantially exceeds the existing noise level (a substantial noise increase). 23 CFR 772 does not specifically define the terms *approach* or *substantial increase*; these criteria are defined in the Protocol, as described below.

Table 4-1 summarizes NAC corresponding to various land use activity categories. Activity categories and related traffic noise impacts are determined based on the actual land use in a given area.

Table 4-1. Activity Categories and Noise Abatement Criteria

Activity Category	NAC, Hourly A-Weighted Noise Level (dBA-L_{eq}[h])	Description of Activities
A	57 Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 Exterior	Picnic areas, recreation areas, playgrounds, active sport areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 Exterior	Developed lands, properties, or activities not included in categories A or B above.
D	—	Undeveloped lands.
E	52 Interior	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

In identifying noise impacts, primary consideration is given to exterior areas of frequent human use. In situations where there are no exterior activities, or where the exterior activities are far from the roadway or physically shielded in a manner that prevents an impact on exterior activities, the interior criterion (Activity Category E) is used as the basis for determining a noise impact (e.g., receptors ST-3 and ST-7, which are hotels).

4.2. State Regulations and Policies

4.2.1. Traffic Noise Analysis Protocol for New Highway Construction and Reconstruction Projects

The Protocol specifies the policies, procedures, and practices to be used by agencies that sponsor new construction or reconstruction of federal or federal-aid highway projects. The NAC specified in the Protocol are the same as those specified in 23 CFR 772. The Protocol defines a noise increase as substantial when the predicted noise levels with project implementation exceed existing noise levels by 12 dBA. The Protocol also states that a sound level is considered to approach an NAC level when the sound level is within 1 dB of the NAC identified in 23 CFR 772 (e.g., 66 dBA is considered to approach the NAC of 67 dBA, but 65 dBA is not).

The TeNS of the Protocol provides detailed technical guidance for the evaluation of highway traffic noise. This includes field measurement methods, noise modeling methods, and report preparation guidance.

4.2.2. Section 216 of the California Streets and Highways Code

Section 216 of the California Streets and Highways Code relates to the noise effects of a proposed freeway project on public and private elementary and secondary schools. Under this code, a noise impact occurs if, as a result of a proposed freeway project, noise levels exceed 52 dBA $L_{eq}(h)$ in the interior of public or private elementary or secondary classrooms, libraries, multipurpose rooms, or spaces. This requirement does not replace the approach or exceed NAC criterion for FHWA Activity Category E for classroom interiors, but it is a requirement that must be addressed in addition to the requirements of 23 CFR 772.

If a project results in a noise impact under this code, noise abatement must be provided to reduce classroom noise to a level that is at or below 52 dBA $L_{eq}(h)$. If the noise levels generated from freeway and nonfreeway sources exceed 52 dBA $L_{eq}(h)$ prior to the construction of the proposed freeway project, then noise abatement must be provided to reduce the noise to the level that existed prior to construction of the project.

Based upon the large distances between the SR-91 and the school classrooms in the area (approximately 700 feet or more), no school classrooms in the project area exceed the standards as set forth above.

Chapter 5. Study Methods and Procedures

5.1. Methods for Identifying Land Uses and Selecting Noise Measurement and Modeling Receiver Locations

A field investigation was conducted to identify land uses that could be subject to traffic and construction noise impacts from the proposed project. Land uses in the project area were categorized by land use type, Activity Category as defined in Table 4-1, and the extent of frequent human use. As stated in the Protocol, although all developed land uses are evaluated in this analysis, the focus is on locations of frequent human use that would benefit from a lowered noise level. Accordingly, this impact analysis focused on locations with defined outdoor activity areas, such as residential backyards, school athletic fields/playgrounds, and parks. Additionally, several of the noise measurements were conducted inside representative hotel/motel rooms adjacent to SR-91 as well as at a commercial land use directly adjacent to SR-91.

The geometry of the project relative to nearby existing land uses was also identified, and the possibility of undeveloped land uses that have been planned, programmed, and designed was investigated by contacting City of Anaheim planning staff. Based on the information provided by City of Anaheim staff, there are no planned, programmed, or designed land uses in the vicinity of the project (i.e., within 1,000 feet of the SR-91 between SR-55 and SR-241).

Short-term measurement locations were selected to represent the various noise-sensitive land use types and areas within the project area. Additionally, long term measurement sites were selected to capture the diurnal traffic noise level patterns in the project area (typically, these were selected to represent the areas between major roadway intersections along both sides of the freeway). Short-term and long-term measurement locations were selected to serve as representative modeling locations. Additional nonmeasurement locations were selected as modeling locations, in order to gain a more complete understanding of the noise environment in the project area.

5.2. Field Measurement Procedures

A field noise study was conducted in accordance with recommended procedures in TeNS. The following is a summary of the procedures used to collect short-term and long term sound level data.

5.2.1. Short-Term Measurements

Short-term monitoring was conducted at 28 locations between February 27, 2008, and March 11, 2008, using Larson Davis Type 1 (Precision grade) and Rion Type 2 (General Purpose grade) sound level meters (serial numbers 0432, 776887, and 773232). A minimum of two consecutive but separate measurements (each 10 minutes in duration) were taken at each site. Short-term monitoring was primarily conducted at Activity Category B land uses. Several short-term measurements were also conducted at Activity Category E land uses (hotel/motel rooms), and a measurement was conducted at an Activity Category C (commercial) land use. The short-term measurement locations are identified in Figure 5-1.

During the short-term measurements, field staff attended each meter. The L_{eq} values collected during the measurement period (typically 10 minutes in duration) were automatically recorded with the digital integrating sound level meters and subsequently logged manually on field data sheets used for each measurement location. Dominant noise sources observed and other relevant measurement conditions were also identified and logged manually on the field data sheets. In all cases, traffic noise was observed to be the dominant contributor to the measured noise levels. The calibration of the meter was checked before and after the measurement using a Larson-Davis Model CA250 calibrator (serial number 0125).

Temperature, wind speed, and humidity were recorded manually during the short-term monitoring sessions using a Kestrel 3000 portable weather station. During the short-term measurements, wind speeds typically ranged from 0 to 5 miles per hour (mph). Temperatures typically ranged from 70–80°F, with relative humidity typically 20–50%.

Traffic on SR-91 was classified and counted during the short-term noise measurements. Vehicles were classified as automobiles, medium-duty trucks, heavy-duty trucks, busses, or motorcycles. An automobile was defined as a vehicle with two axles and four tires designed primarily to carry passengers. Small vans and light trucks were included in this category. Medium-duty trucks included all cargo vehicles with two axles and six tires. Heavy-duty trucks included all vehicles with three or more axles. Vehicle speeds were estimated by "driving the pace" of traffic periodically, during the course of the days during which noise measurements were conducted, and by visually monitoring that traffic was flowing freely. The posted speed on SR-91 in the project area was 65 mph.

5.2.2. Long -Term Measurements

Long-term monitoring was conducted at nine locations (LT-1 through LT-9) using Rion Model NL-21 and NL-22 sound level meters (serial numbers 773232, 776887, and 676771). The purpose of these measurements was to identify the diurnal noise traffic noise patterns throughout the typical day/night cycle. The long-term sound level data was collected over time periods of 24 hours or more, beginning February 27, 2008, and ending March 13, 2008.

The long-term noise monitor locations are shown in Figure 5-1. Long-term monitoring location LT-1 was located at the multi-family residences at 8604 East Whitewater Avenue on the south side of SR-91 east of Weir Canyon Road, approximately 280 feet from the SR-91 edge-of-pavement. LT-2 was located at the Canyon RV Park at 24001 East Santa Ana Canyon Road, on the north side of SR-91 adjacent to the SR-91/SR-241 interchange, approximately 110 feet from the SR-91 edge-of-pavement. LT-3 was located at 7645 Camino Tampico, in the rear yard of a single-family residence on the south side of SR-91 west of Weir Canyon Road, approximately 115 feet from the SR-91 edge-of-pavement. LT-4 was located at 253 Mary Lane, adjacent to a single-family residence at the Friendly Valley Mobile Home Park, north of SR-91 and East La Palma Avenue, approximately 750 feet from the SR-91 edge-of-pavement. LT-5 was located at 5901 Camino Manzano, in the rear yard of a single-family residence on the south side of SR-91 between Weir Canyon Road and Imperial Highway, approximately 240 feet from the SR-91 edge-of-pavement. LT-6 was located at 4864 East McKinnon Drive, in the rear yard of a single-family residence on the north side of SR-91 east of Lakeview Avenue, approximately 40 feet from the SR-91 edge-of-pavement. LT-7 was located at Peralta Canyon Park (115 North Pinney Drive), just west of a row of residences on the south side of SR-91 east of Lakeview Avenue, approximately 50 feet from the SR-91 edge-of-pavement. LT-8 was located at a residence at 131 Deerfield Street, on the north side of SR-91 west of Lakeview Avenue, approximately 300 feet from the SR-91 edge-of-pavement. LT-9 was located at a residence at 300 Lakedale Drive, on the north side of SR-91 west of Lakeview Avenue, approximately 120 feet from the SR-91 edge-of-pavement.

5.3. Traffic Noise Levels Prediction Methods

Traffic noise levels were predicted using the FHWA Traffic Noise Model Version 2.5 (TNM 2.5). TNM 2.5 is a computer model based on two FHWA reports: FHWA-PD-96-009 and FHWA-PD-96-010 (FHWA 1998a, 1998b). Key inputs to the traffic noise model were the locations of roadways, shielding features (e.g., topography and

buildings), noise barriers, ground type, and receivers. Three-dimensional representations of these inputs were developed using CAD drawings, aerials, and topographic contours provided by Department District 12 design staff.

Traffic noise was evaluated under existing conditions, design year without-project conditions, and design year with-project conditions. Tables A-1 to A-3 in Appendix A summarize the traffic volumes and assumptions used for modeling existing and design-year conditions with and without the project.

The loudest hour is generally characterized by high-volume but free-flowing traffic at the highway design speed (i.e., level of service [LOS] D/E or better). Although the addition of one to two GP lanes in each direction of the SR-91 would provide some improvement of LOS, the SR-91 would remain at LOS D/E or higher during peak hours. For this analysis, it is assumed (based upon direction from Department project staff) that each GP lane has a maximum capacity of 1,900 vehicles per hour per lane (vphpl) at the design speed of the highway. Toll lanes are assumed to operate at 1,500 vphpl. Ramp volumes for the Lakeview, Imperial Highway, Weir Canyon, Gypsum Canyon, and SR-241 ramps were derived from the Freeway Performance Measurement System (PeMS) automated traffic data retrieval system, using the traffic data from a 3-month sample of recent hourly loop count data.

To validate the accuracy of the model, TNM 2.5 was used to compare measured traffic noise levels to modeled noise levels at field measurement locations. For each receiver, traffic volumes counted during the short-term measurement periods were normalized to 1-hour volumes. These normalized volumes were assigned to the corresponding project area roadways to simulate the noise source strength at the roadways during the actual measurement period. Modeled and measured sound levels were then compared to determine the accuracy of the model and if additional calibration of the model was necessary.

5.4. Methods for Identifying Traffic Noise Impacts and Consideration of Abatement

Traffic noise impacts occur at receiver locations where predicted design-year noise levels are at least 12 dB greater than existing noise levels, or where predicted design year noise levels approach or exceed the NAC for the applicable activity category. Where traffic noise impacts are identified, noise abatement must be considered for reasonableness and feasibility as required by 23 CFR 772 and the Protocol.

According to the Protocol, abatement measures are considered acoustically feasible if a minimum noise reduction of 5 dB at impacted receiver locations is predicted with implementation of the abatement measures. In addition, barriers should be designed to intercept the line-of-sight from the exhaust stack of a truck to the first tier of receivers, as required by the Highway Design Manual, Chapter 1100. Other factors that affect feasibility include topography, access requirements for driveways and ramps, presence of local cross streets, utility conflicts, other noise sources in the area, and safety considerations. The overall reasonableness of noise abatement is determined by considering factors such as cost; absolute predicted noise levels; predicted future increase in noise levels; expected noise abatement benefits; build date of surrounding residential development along the highway; environmental impacts of abatement construction; opinions of affected residents; input from the public and local agencies; and social, legal, and technological factors.

The Protocol defines the procedure for assessing reasonableness of noise barriers from a cost perspective. A cost-per-residence allowance is calculated for each benefited residence (i.e., residences that receive at least 5 dB of noise reduction from a noise barrier). The 2007 base allowance is $32,000. Additional allowance dollars are added to the base allowance based on absolute noise levels, the increase in noise levels resulting from the project, achievable noise reduction, and the date of building construction in the area. Total allowances are calculated by multiplying the cost-per-residence by the number of benefited residences. If the total allowance for all evaluated noise barriers is more than 50% of the estimated construction cost, the allowance per residence is modified to a reduced value.

Chapter 6. Existing Noise Environment

6.1. Existing Land Uses

A field investigation was conducted to identify land uses that could be subject to traffic and construction noise impacts from the proposed project. Single-family residences, multi-family residences, several school athletic fields, several parks, and a campground/RV park were identified as Activity Category B land uses in the project area. Several commercial uses in the area are Activity Category C land uses. Several hotels in the area are Activity Category E land uses.

As required by the Protocol, although all developed land uses are evaluated in this analysis, noise abatement is only considered for areas of frequent human use that would benefit from a lowered noise level. Accordingly, this impact analysis focuses on locations with defined outdoor activity areas, such as residential backyards and common use areas at multi-family residences. The two nearest hotels (–Activity Category E land uses) also are addressed.

Land uses in the project area have been grouped into a series of lettered analysis areas that are identified in Figure 5-1. Each of these analysis areas is considered acoustically equivalent.

- Area A: Area A is located on the north side of SR-91 west of Lakeview Avenue. A residential neighborhood (Activity Category B) is located in this area. The ground generally slopes down from the freeway in this area. Rear yards and side yards face the highway. A noise barrier with a nominal height of 14 feet is located between SR-91 and the residential area.
- Area B: Area B is located on the south side of SR-91 west of Lakeview Avenue. A residential neighborhood (Activity Category B) is located in this area. This area is generally elevated relative to the freeway. Rear yards and side yards face the freeway. A noise barrier with a nominal height of 16 feet is located along most of the frontage between SR-91 and the residential uses. Additionally, a short, supplemental noise barrier with a nominal height of 10 feet is located just west of Lakeview Avenue and east of the eastbound SR-91 off-ramp.
- Area C: Area C is located on the north side of SR-91 east of Lakeview Avenue. Residential land uses (Activity Category B) are located in this area. The ground generally slopes away slightly from the freeway in this area, which means the

developed areas are lower than the highway. Rear yards and side yards face the freeway. Two noise barriers, one along the westbound SR-91 off-ramp with a nominal height of 10 feet and one along the main freeway lanes with a nominal height of 14 feet, are located between the freeway and the residences. In addition, a private school (Activity Category B) is located approximately 1 mile east of Lakeview Avenue, on the north side of the Santa Ana River. Although both the classrooms and the athletic fields are located over 1,000 feet north of SR-91, noise measurements were conducted at the athletic fields (ST-25) in order to document existing traffic noise levels at this location (Activity Category B).

- Area D: Area D is located on the south side of SR-91 east of Lakeview Avenue and west of Imperial Highway. Residential land uses (Activity Category B), school athletic fields and an adjacent park (Activity Category B), and commercial uses (Activity Category C) are located in this area. At the western end, the residences are slightly elevated with respect to the freeway; the remaining area is generally at-grade with the freeway. Rear yards face the freeway. A noise barrier with a nominal height of 14 feet is located between the highway and the noise-sensitive land uses. Outdoor areas associated with the commercial land uses are parking lots. Therefore, no outdoor areas associated with the commercial uses are considered areas of frequent human use.
- Area E: Area E is located on the north side of SR-91 east of Imperial Highway. Residential and recreational land uses (Activity Category B) are located in this area, north of the Santa Ana River and East La Palma Avenue. The area is generally several feet higher than SR-91. Although these land uses are located over 750 feet north of SR-91, noise measurements were conducted at several locations in this area (LT-4 and ST5) in order to document existing traffic noise levels.
- Area F: Area F is located on the south side of SR-91 east of Imperial Highway and west of Weir Canyon Road. Commercial land uses (Activity Category C) are located at the western and eastern ends of this area. With the following exceptions, the outdoor areas associated with the commercial land uses are parking lots and therefore not considered areas of frequent human use.
    - One of the commercial uses is a hotel (ST-7) that has no exterior noise-sensitive land uses with an exposure to the SR-91 (the pool area is located behind the multi-story building and is well shielded) but has guest rooms which face the freeway. Thus, this land use was analyzed as Activity Category E.

- To the east of the hotel is a car dealership (ST-8) with its outdoor display and sales area facing the freeway, which was analyzed as Activity Category C.

The majority of the SR-91 frontage in Area F consists of residential land use (Activity Category B). Rear yards face the freeway. Along the western portion of the residential area, a noise barrier with a nominal height of 14 feet is located between the freeway and the residences at the residential property line. The remaining residences located to the east have residential walls with a nominal height of 6 feet atop a berm that varies in height from approximately 1 foot on the west side to approximately 6 feet on the east side. At the western end of Area F (near the hotel and car dealership), the local ground is lower than the freeway; along the remaining portion of Area F, the local ground is approximately at-grade.

- Area G: Area G is located on the north side of SR-91 east of Weir Canyon Road and west of the SR-91/SR-241 interchange. Commercial land uses (Activity Category C) are located at the western end of this area. With the following exception, the outdoor areas associated with the commercial land uses are parking lots and therefore not considered areas of frequent human use. One of the commercial uses is a hotel (ST-3) that has no exterior noise-sensitive land uses with an exposure to the SR-91 (the pool area is located behind the multi-story building and is well shielded) but has guest rooms which face the freeway. Thus, this land use was analyzed as Activity Category E. To the east, the remainder of the SR-91 frontage in Area G consists of an RV campground (Activity Category B). A noise barrier with a nominal height of 12 feet is located between the freeway and the campground facility. A prior noise analysis of the campground was conducted (Sound Wall Analysis Report, Canyon RV Park, July 26, 2004) in which an additional noise barrier varying in height from 14 to 16 feet was recommended for construction in the area represented in the current noise analysis by receptors M-2 and LT-2. At the western end of Area G (near the hotel), the local ground is lower than the freeway; along the remaining portion of Area G, the local ground is approximately at-grade.

- Area H: Area H is located on the south side of SR-91 east of Weir Canyon Road and west of the SR-91/SR-241 interchange. Commercial land uses (Activity Category C) are located at the western side of Area H. The outdoor areas associated with the commercial land uses are parking lots and therefore not considered areas of frequent human use. The remainder of the SR-91 frontage in Area H consists of single- and multi-family residential (Activity Category B) and undeveloped lands (Activity Category D). At the western end of Area H, the local ground is elevated above the

freeway; along the remaining portion of Area G, the local ground is approximately at-grade.

6.2. Noise Measurement Results

The existing noise environment in the project area is characterized below based on the short- and long-term noise monitoring that was conducted.

6.2.1. Short-Term Monitoring

Table 6-1 summarizes the results of the short-term noise monitoring conducted in the project area. Table 6-1 lists the receptor name, address, geographical area identifier, land use/activity category, measurement start time date and duration, measured L_{eq}, traffic count data, and estimated peak-noise-hour (using the corresponding long-term noise monitoring data).

Table 6-1. Summary of Short-Term Measurements

Receptor	Address	Area	Land Uses/ Activity Category	Start Time/Date	Duration (minutes)	Measured L_{eq}	Autos	Medium Trucks	Heavy Trucks	Buses	Motorcycles	Observed Speed (mph)	Adjusted Peak-Noise-Hour (dBA L_{eq})
ST-1a	24001 Santa Ana Canyon Road	G	Recreation RV Park cabins / Activity Category B	10:20 AM 2/27/08	10:00	65.8	1700	51	100	0	10	65	70
ST-1b				10:35 AM 2/27/08	10:00	65.9	—	—	—	—	—	—	—
ST-2a	8720 Santa Ana Canyon Road	H	Residential / Activity Category B	12:09 PM 2/27/08	10:00	71.0	1578	61	121	3	4	65	73
ST-2b				12:20 PM 2/27/08	10:00	70.9	—	—	—	—	—	—	—
ST-3a	22677 Oakcrest Circle Ayres Hotel	G	Hotel (Window Closed) / Activity Category E	13:40 PM 2/27/08	10:00	38.4	1730	22	93	3	5	65	39
ST-3b			Hotel (Window Open) / Activity Category E	13:55 PM 2/27/08	10:00	66.4	1730	—	—	—	—	—	67
ST-3c			Hotel (Window Closed) / Activity Category E	14:05 PM 2/27/08	10:00	39.4	—	—	—	—	—	—	—
ST-3d			Hotel At pool area in rear / Activity Category B	14:25 PM 2/27/08	10:00	53.4	—	—	—	—	—	—	—

Table 6-1. Continued

Receptor	Address	Area	Land Uses/ Activity Category	Start Time/Date	Duration (minutes)	Measured L_{eq}	Autos	Medium Trucks	Heavy Trucks	Buses	Motorcycles	Observed Speed (mph)	Adjusted Peak-Noise-Hour (dBA L_{eq})
ST-4a	8487 Amberwood Street	H	Residential / Activity Category B	14:55 PM 2/27/08	10:00	62.7	2530	40	52	1	14	65	65
ST-4b				15:05 PM 2/27/08	10:00	61.8	—	—	—	—	—	—	—
ST-5a	Yorba Linda Regional Park	E	Recreation / Activity Category B	12:00 PM 2/28/08	10:00	58.5	2628	68	100	0	6	65	63
ST-5b				12:15 PM 2/28/08	10:00	59.6	—	—	—	—	—	—	—
ST-6a	7725 Camino Tampico	F	Residential / Activity Category B	13:15 PM 2/28/08	10:00	64.7	—	—	—	—	—	—	67
ST-6b				13:30 PM 2/28/08	10:00	65.5	—	—	—	—	—	—	—
ST-7a	Fairfield Inn 201 N. Via Cortez	F	Hotel (Window Closed) / Activity Category E	14:50 PM 2/28/08	10:00	42.5	2363	64	80	2	13	65	47
ST-7b			Hotel (Window Open) / Activity Category E	14:50 PM 2/28/08	10:00	71.8	2363	64	80	2	13	65	75
ST-7c			Hotel (Window Closed) / Activity Category E	15:03 PM 2/28/08	10:00	46.7	—	—	—	—	—	—	—

Table 6-1. Continued

Receptor	Address	Area	Land Uses/ Activity Category	Start Time/Date	Duration (minutes)	Measured L_{eq}	Autos	Medium Trucks	Heavy Trucks	Buses	Motorcycles	Observed Speed (mph)	Adjusted Peak-Noise-Hour (dBA L_{eq})
ST-7d			Hotel (Window Open) / Activity Category E	15:03 PM 2/28/08	10:00	72.9	—	—	—	—	—	—	—
ST-7e			Hotel (Window Closed) / Activity Category E	15:20 PM 2/28/08	10:00	42.6	—	—	—	—	—	—	—
ST-7f			Hotel (Window Open) / Activity Category E	15:20 PM 2/28/08	10:00	73.5	—	—	—	—	—	—	—
ST-7g			Hotel (Pool area at rear) / Activity Category **B**	15:45 PM 2/28/08	10:00	56.1	2363	64	80	2	13	65	59
ST-8a	Mercedes Dealership 200 N. Via Cortez	F	Commercial / Activity Category C	15:57 PM 2/28/08	10:00	67.3	2146	56	55	13	33	65	70
ST-8b				16:10 PM 2/28/08	10:00	66.4	—	—	—	—	—	—	—
ST-9a	Between 5810 & 5820 E. Camino Manzano	F	Recreation Park between residences / Activity Category **B**	10:16 AM 3/4/08	10:00	58.4	1400	68	125	1	2	65	60
ST-9b				10:27 AM 3/4/08	10:00	58.7	—	—	—	—	—	—	—
ST-10a	5861 E. Camino Manzano	F	Residential / Activity Category **B**	10:13 AM 3/4/08	10:00	62.5	1400	68	125	1	2	65	64

Table 6-1. Continued

Receptor	Address	Area	Land Uses/ Activity Category	Start Time/Date	Duration (minutes)	Measured L_{eq}	Autos	Medium Trucks	Heavy Trucks	Buses	Motorcycles	Observed Speed (mph)	Adjusted Peak-Noise-Hour (dBA L_{eq})
ST-10b				10:26 AM 3/4/08	10:00	62.3	—	—	—	—	—	—	—
ST-11a	6261 E. Camino Manzano	F	Residential / Activity Category **B**	11:26 AM 3/4/08	10:00	66.2	1526	75	152	5	16	65	68
ST-11b				11:37 AM 3/4/08	10:00	65.6	—	—	—	—	—	—	—
ST-12a	6039 E. Camino Manzano	F	Residential / Activity Category **B**	11:24 AM 3/4/08	10:00	67.0	1526	75	152	5	16	65	69
ST-12b				11:35 AM 3/4/08	10:00	66.4	—	—	—	—	—	—	—
ST-14a	7441 Calle Granada	F	Residential / Activity Category **B**	13:50 PM 3/4/08	10:00	68.0	1959	60	98	4	8	65	70
ST-14b				14:02 PM 3/4/08	10:00	67.8	—	—	—	—	—	—	—
ST-15a	290 Calle Segovia	F	Residential / Activity Category **B**	13:50 PM 3/4/08	10:00	56.9	1959	60	98	4	8	65	59
ST-15b				14:02 PM 3/4/08	10:00	56.2	—	—	—	—	—	—	—
ST-16a	5573 Edgemar Avenue	D	Residential / Activity Category **B**	15:16 PM 3/4/08	10:00	55.6	2361	54	59	2	0	65	59
ST-16b				15:28 PM 3/4/08	10:00	58.4	—	—	—	—	—	—	—
ST-17a	5533 Edgemar Avenue	D	Residential / Activity Category **B**	11:20 AM 3/5/08	10:00	60.1	2185	89	115	8	2	65	62

Table 6-1. Continued

Receptor	Address	Area	Land Uses/ Activity Category	Start Time/Date	Duration (minutes)	Measured L_{eq}	Autos	Medium Trucks	Heavy Trucks	Buses	Motorcycles	Observed Speed (mph)	Adjusted Peak-Noise-Hour (dBA L_{eq})
ST-17b				11:33 AM 3/5/08	10:00	62.0	—	—	—	—	—	—	—
ST-18a	Crescent Elementary School 5125 E Gerda Drive	D	School Athletic Field / Activity Category B	11:25 AM 3/5/08	10:00	65.5	2185	89	115	8	2	65	67
ST-18b				11:35 AM 3/5/08	10:00	65.5	—	—	—	—	—	—	—
ST-19a	4836 Wasatch Drive	D	Residential / Activity Category B	12:30 PM 3/5/08	10:00	58.7	2203	94	93	4	18	65	59
ST-19b				12:43 PM 3/5/08	10:00	57.0	—	—	—	—	—	—	—
ST-20a	4837 Wasatch Drive	D	Residential / Activity Category B	12:34 PM 3/5/08	10:00	65.6	2203	94	93	4	18	65	66
ST-20b				12:45 PM 3/5/08	10:00	65.7	—	—	—	—	—	—	—
ST-21a	4932 E. Wasatch Drive	D	Residential / Activity Category B	13:31 PM 3/5/08	10:00	64.8	2763	100	98	4	11	65	66
ST-21b				13:44 PM 3/5/08	10:00	64.3	—	—	—	—	—	—	—
ST-22a	4824 McKinnon Drive	C	Residential / Activity Category B	13:33 PM 3/5/08	10:00	59.4	2763	100	98	4	11	65	60
ST-22b				13:46 PM 3/5/08	10:00	59.4	—	—	—	—	—	—	—
ST-23a	4878 Gayann Drive	C	Residential / Activity Category B	10:01 AM 3/6/08	10:00	56.7	2475	78	103	4	8	65	57
ST-23b				10:24 AM 3/6/08	10:00	56.2	—	—	—	—	—	—	—

Table 6-1. Continued

Receptor	Address	Area	Land Uses/ Activity Category	Start Time/Date	Duration (minutes)	Measured L_{eq}	Autos	Medium Trucks	Heavy Trucks	Buses	Motorcycles	Observed Speed (mph)	Adjusted Peak-Noise-Hour (dBA L_{eq})
ST-24a	421 Roni Lane	C	Residential / Activity Category B	10:00 AM 3/6/08	10:00	56.1	2475	78	103	4	8	65	57
ST-24b				10:20 AM 3/6/08	10:00	55.2	—	—	—	—	—	—	—
ST-25a	5340 La Palma Avenue	C	School Athletic Field / Activity Category B	11:27 AM 3/6/08	10:00	53.3	1863	81	105	1	2	65	56
ST-25b				11:38 AM 3/6/08	10:00	53.9	—	—	—	—	—	—	—
ST-26a	4343 E. Addiington Drive	A	Residential / Activity Category B	10:20 AM 3/11/08	10:00	51.5	2259	78	115	2	9	65	57
ST-26b				10:33 AM 3/11/08	10:00	50.7	—	—	—	—	—	—	—
ST-27a	280 Starling Way	A	Residential / Activity Category B	10:15 AM 3/11/08	10:00	55.6	2259	78	115	2	9	65	62
ST-27b				10:30 AM 3/11/08	10:00	54.5	—	—	—	—	—	—	—
ST-28a	121 Cerro Vista Way	B	Residential / Activity Category B	11:48 AM 3/11/08	10:00	59.5	2006	82	101	2	11	65	63
ST-28b				12:00 PM 3/11/08	10:00	60.0	—	—	—	—	—	—	—
ST-29a	126 South Peralta Hills Drive	B	Residential / Activity Category B	11:50 AM 3/11/08	10:00	60.9	2006	82	101	2	11	65	65
ST-29b				12:00 PM 3/11/08	10:00	60.5	—	—	—	—	—	—	—

Note: Refer to Figure 5-1 for measurement locations and boundaries of each area.

6.2.2. Long-Term Monitoring

Long-term monitoring was conducted at nine locations (LT-1 through LT-9). The purpose of the long-term noise measurements was to determine the changes in noise levels within the project area throughout a typical day. Using the difference, or offset, in the simultaneous noise levels between the short-term and long-term data, the long-term measurements were used to estimate existing peak-noise hour levels at the representative short-term receivers. The long-term sound level data was collected over a period beginning Wednesday, February 27, 2008, and ending Thursday, March 13, 2008. The long-term monitoring locations are shown on Figure 5-1.

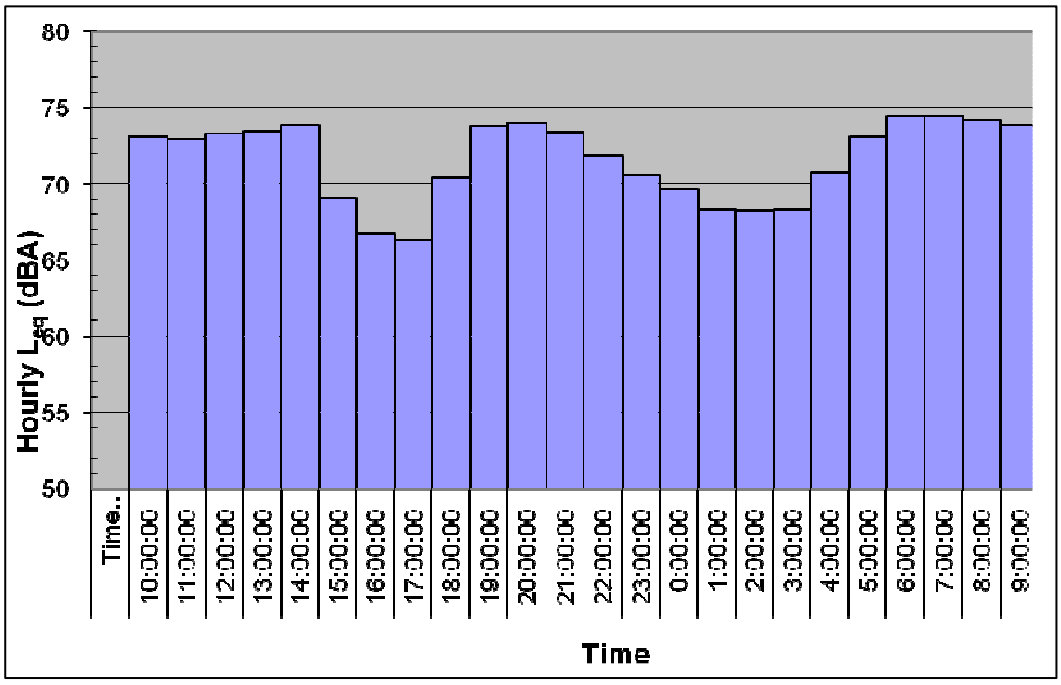
LT-1: Long-term monitoring site LT-1 was located at the multi-family residences at 8604 East Whitewater Avenue on the south side of SR-91 east of Weir Canyon Road, approximately 280 feet from the SR-91 edge-of-pavement. The loudest-hour noise level measured was 74 dBA L_{eq}(h) during the 2 p.m., 7 p.m., 8 p.m., and 6 a.m. through 9 a.m. hours. Table 6-2 and Figure 6-1 summarize the results of the LT-1 data.

Table 6-2. Summary of Long-Term Monitoring at Location LT-1

Date	Time (Hour Beginning)	1-Hour L_{eq} (dBA)	Difference from Loudest Hour (dB)
27-Feb-08	10:00:00	73	-1
	11:00:00	73	-1
	12:00:00	73	-1
	13:00:00	73	-1
	14:00:00	**74**	**0**
	15:00:00	69	-5
	16:00:00	67	-7
	17:00:00	66	-8
	18:00:00	70	-4
	19:00:00	**74**	**0**
	20:00:00	**74**	**0**
	21:00:00	73	-1
	22:00:00	72	-2
	23:00:00	71	-3
28-Feb-08	0:00:00	70	-4
	1:00:00	68	-6
	2:00:00	68	-6
	3:00:00	68	-6
	4:00:00	71	-3

Date	Time (Hour Beginning)	1-Hour L_{eq} (dBA)	Difference from Loudest Hour (dB)
	5:00:00	73	-1
	6:00:00	**74**	**0**
	7:00:00	**74**	**0**
	8:00:00	**74**	**0**
	9:00:00	**74**	**0**
	max	**74**	
	min	66	
Note: Worst-case noise hours are bolded			

Figure 6-1. Long-Term Monitoring at Location LT-1, February 27–28, 2008

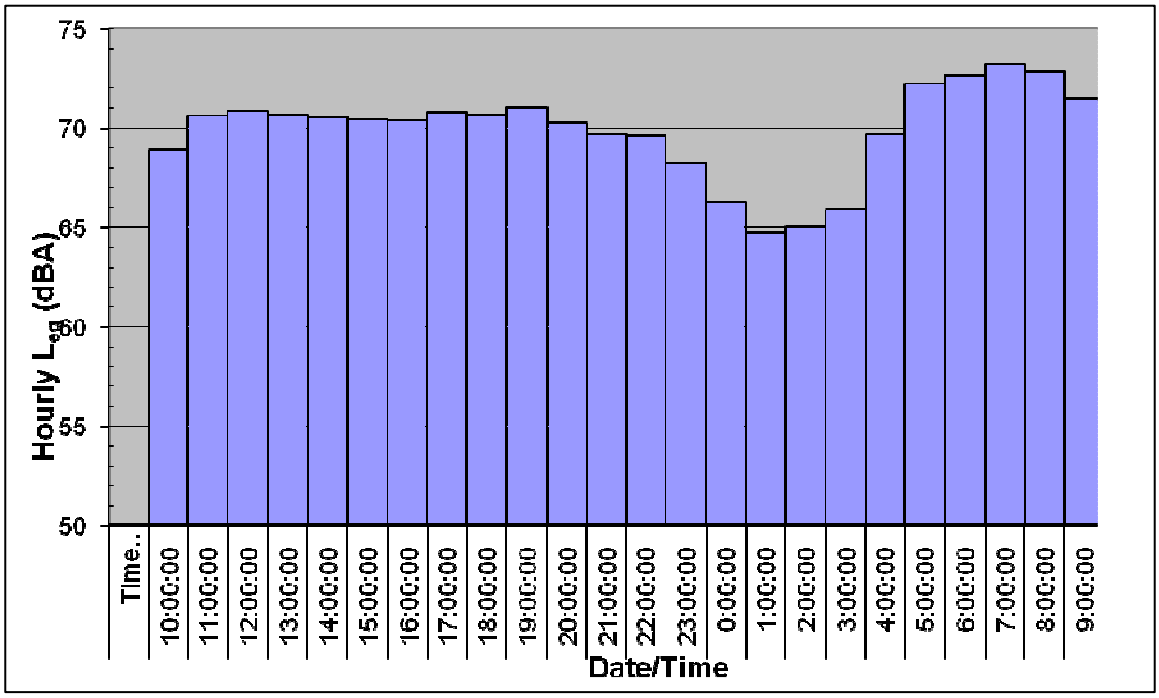


LT-2: LT-2 was located at the Canyon RV Park at 24001 East Santa Ana Canyon Road, on the north side of SR-91 adjacent to the SR-91/SR-241 interchange, approximately 110 feet from the SR-91 edge-of-pavement. The loudest-hour noise level measured was 73 dBA L_{eq}(h) during the 6 a.m. through 8 a.m. hours. Table 6-3 and Figure 6-2 summarize the results of the LT-2 data.

Table 6-3. Summary of Long-Term Monitoring at Location LT-2

Date	Time (Hour Beginning)	1-Hour L_{eq} (dBA)	Difference from Loudest Hour (dB)
12-Mar-08	10:00:00	69	-4
	11:00:00	71	-2
	12:00:00	71	-2
	13:00:00	71	-2
	14:00:00	71	-2
	15:00:00	70	-3
	16:00:00	70	-3
	17:00:00	71	-2
	18:00:00	71	-2
	19:00:00	71	-2
	20:00:00	70	-3
	21:00:00	70	-3
	22:00:00	70	-3
	23:00:00	68	-5
13-Mar-08	0:00:00	66	-7
	1:00:00	65	-8
	2:00:00	65	-8
	3:00:00	66	-7
	4:00:00	70	-3
	5:00:00	72	-1
	6:00:00	**73**	**0**
	7:00:00	**73**	**0**
	8:00:00	**73**	**0**
	9:00:00	72	-1
	max	**73**	
	min	65	
Note: Worst-case noise hours are bolded			

Figure 6-2. Long-Term Monitoring at Location LT-2, March 12–13, 2008



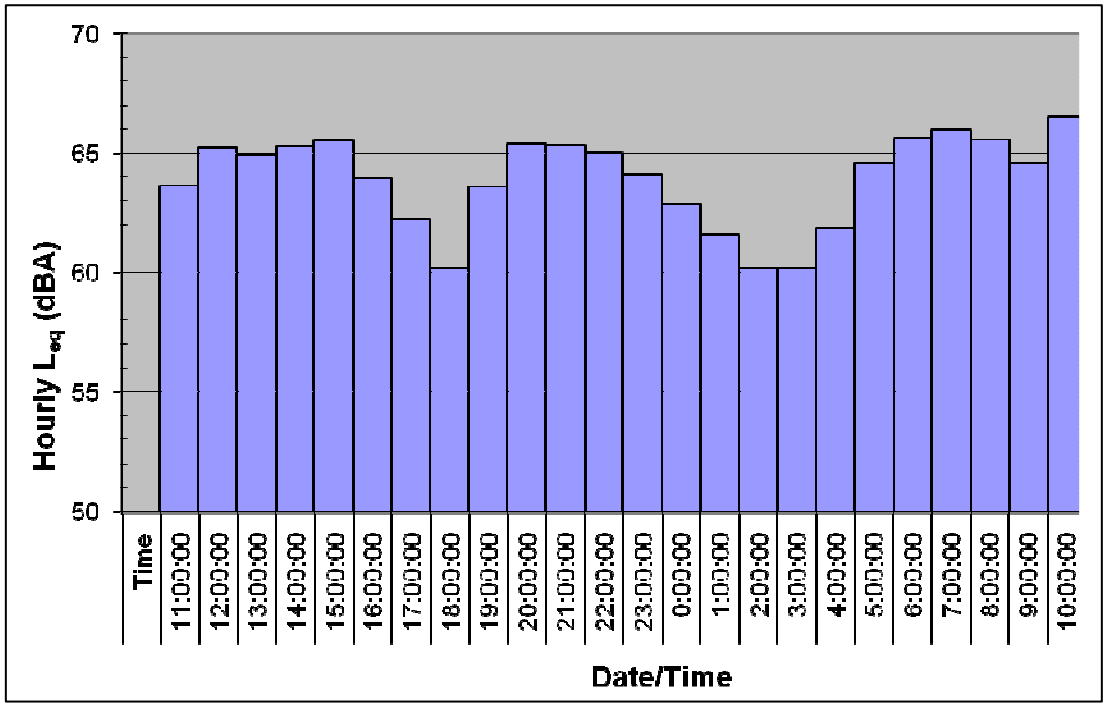
LT-3: LT-3 was located at 7645 Camino Tampico, in the rear yard of a single-family residence on the south side of SR-91 west of Weir Canyon Road, approximately 115 feet from the SR-91 edge-of-pavement. The loudest-hour noise level measured was 66 dBA $L_{eq}(h)$ during the 3 p.m. and 6 a.m. through 8 a.m. hours. Table 6-4 and Figure 6-3 summarize the results of the LT-3 data.

Table 6-4. Summary of Long-Term Monitoring at Location LT-3

Date	Time (Hour Beginning)	1-Hour L_{eq} (dBA)	Difference from Loudest Hour (dB)
28-Feb-08	11:00:00	64	-2
	12:00:00	65	-1
	13:00:00	65	-1
	14:00:00	65	-1
	15:00:00	**66**	**0**
	16:00:00	64	-2
	17:00:00	62	-4
	18:00:00	60	-6
	19:00:00	64	-2
	20:00:00	65	-1

Date	Time (Hour Beginning)	1-Hour L_{eq} (dBA)	Difference from Loudest Hour (dB)
	21:00:00	65	-1
	22:00:00	65	-1
	23:00:00	64	-2
29-Feb-08	0:00:00	63	-3
	1:00:00	62	-4
	2:00:00	60	-6
	3:00:00	60	-6
	4:00:00	62	-4
	5:00:00	65	-1
	6:00:00	**66**	**0**
	7:00:00	**66**	**0**
	8:00:00	**66**	**0**
	9:00:00	65	-1
	10:00:00	67	1
	max	**66**	
	min	60	
Note: Worst-case noise hours are bolded			

Figure 6-3. Long-Term Monitoring at Location LT-3, February 28–29, 2008

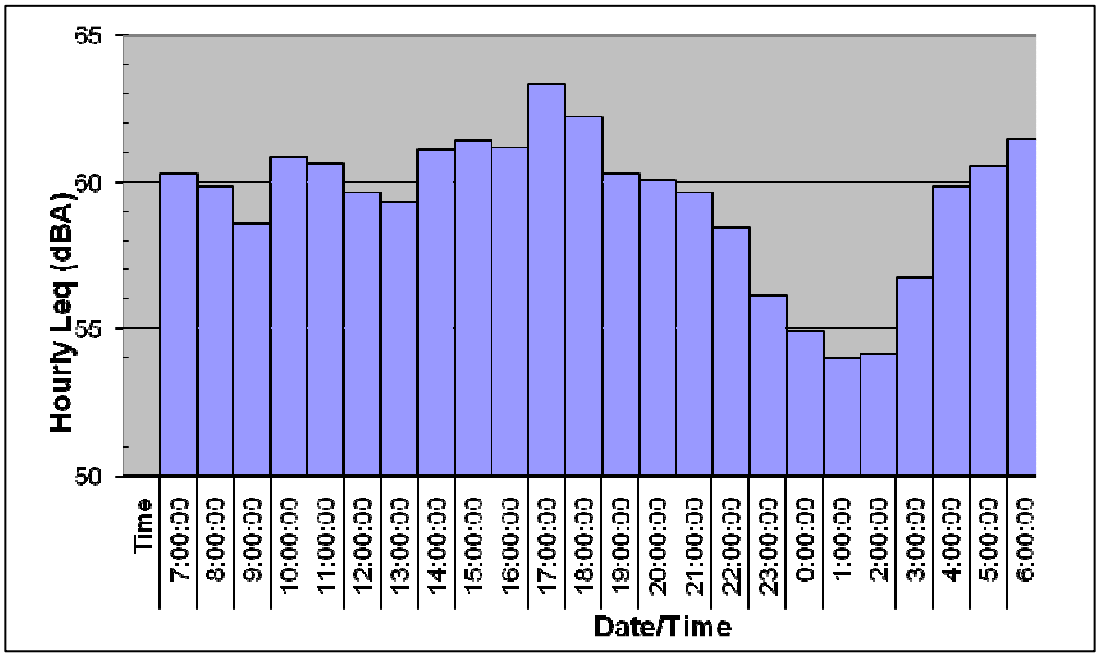


LT-4: LT-4 was located at 253 Mary Lane, adjacent to a single-family residence at the Friendly Valley Mobile Home Park, north of SR-91 and East La Palma Avenue, approximately 750 feet from the SR-91 edge-of-pavement. The loudest-hour noise level measured was 63 dBA L_{eq}(h) during the 5 p.m. hour. Table 6-5 and Figure 6-4 summarize the results of the LT-4 data.

Table 6-5. Summary of Long-Term Monitoring at Location LT-4

Date	Time (Hour Beginning)	1-Hour L_{eq} (dBA)	Difference from Loudest Hour (dB)
4-Mar-08	7:00:00	60	-3
	8:00:00	60	-3
	9:00:00	59	-4
	10:00:00	61	-2
	11:00:00	61	-2
	12:00:00	60	-3
	13:00:00	59	-4
	14:00:00	61	-2
	15:00:00	61	-2
	16:00:00	61	-2
	17:00:00	**63**	**0**
	18:00:00	62	-1
	19:00:00	60	-3
5-Mar-08	20:00:00	60	-3
	21:00:00	60	-3
	22:00:00	58	-5
	23:00:00	56	-7
	0:00:00	55	-8
	1:00:00	54	-9
	2:00:00	54	-9
	3:00:00	57	-6
	4:00:00	60	-3
	5:00:00	61	-2
	6:00:00	61	-2
	max	**63**	
	min	54	
Note: Worst-case noise hours are bolded			

Figure 6-4. Long-Term Monitoring at Location LT-4, March 4–5, 2008



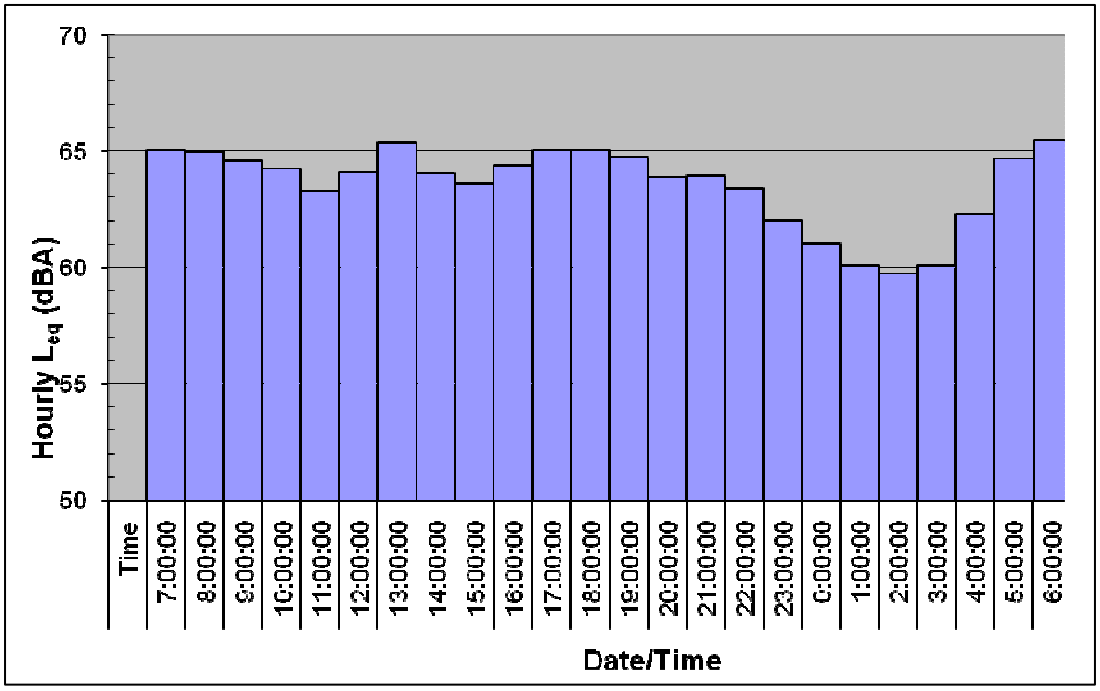
LT-5: LT-5 was located at 5901 Camino Manzano, in the rear yard of a single-family residence on the south side of SR-91 between Weir Canyon Road and Imperial Highway, approximately 240 feet from the SR-91 edge-of-pavement. The loudest-hour noise level measured was 65 dBA L_{eq}(h) during the 7 a.m. to 9 a.m., 1 p.m., 5 p.m. to 7 p.m., and 5 a.m. to 6 a.m. hours. Table 6-6 and Figure 6-5 summarize the results of the LT-5 data.

Table 6-6. Summary of Long-Term Monitoring at Location LT-5

Date	Time (Hour Beginning)	1-Hour L_{eq} (dBA)	Difference from Loudest Hour (dB)
4-Mar-08	**7:00:00**	**65**	**0**
	8:00:00	**65**	**0**
	9:00:00	**65**	**0**
	10:00:00	64	-1
	11:00:00	63	-2
	12:00:00	64	-1
	13:00:00	**65**	**0**
	14:00:00	64	-1
	15:00:00	64	-1
	16:00:00	64	-1
	17:00:00	**65**	**0**

Date	Time (Hour Beginning)	1-Hour L_{eq} (dBA)	Difference from Loudest Hour (dB)
	18:00:00	**65**	**0**
	19:00:00	**65**	**0**
	20:00:00	64	-1
	21:00:00	64	-1
	22:00:00	63	-2
	23:00:00	62	-3
5-Mar-08	0:00:00	61	-4
	1:00:00	60	-5
	2:00:00	60	-5
	3:00:00	60	-5
	4:00:00	62	-3
	5:00:00	**65**	**0**
	6:00:00	**65**	**0**
	max	**65**	
	min	60	
Note: Worst-case noise hours are bolded			

Figure 6-5. Long-Term Monitoring at Location LT-5, March 4–5, 2008

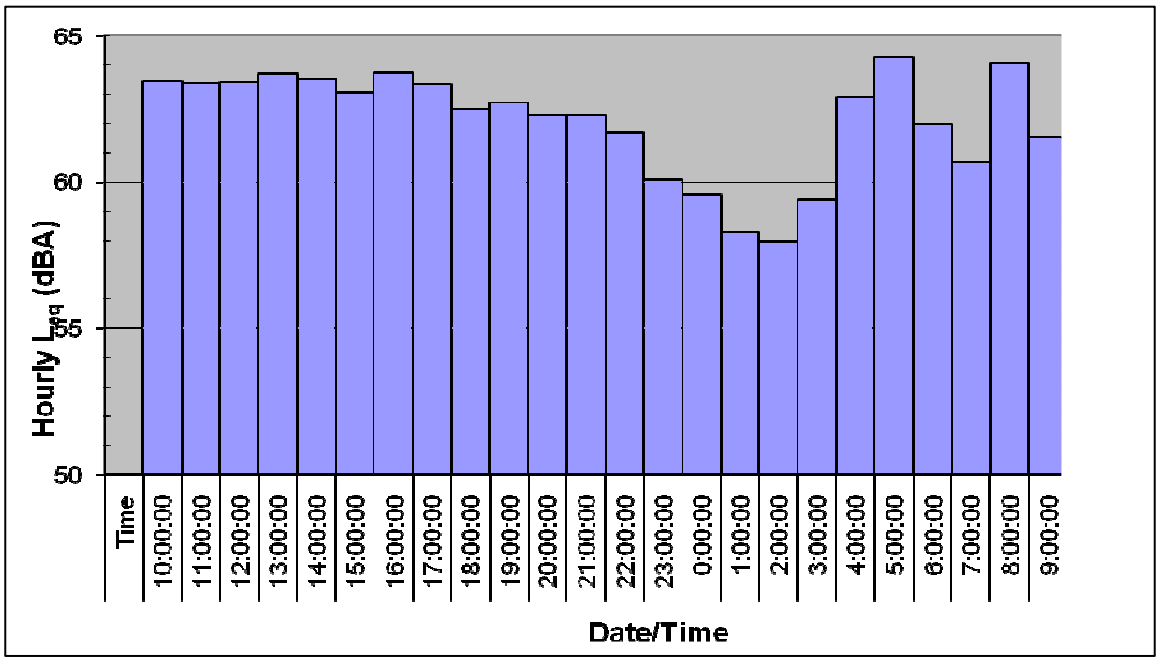


LT-6: LT-6 was located at 4864 East McKinnon Drive, in the rear yard of a single-family residence on the north side of SR-91 east of Lakeview Avenue, approximately 40 feet from the SR-91 edge-of-pavement. The loudest-hour noise level measured was 64 dBA $L_{eq}(h)$ during the 1 p.m., 2 p.m., 4 p.m., 5 a.m., and 8 a.m. hours. Table 6-7 and Figure 6-6 summarize the results of the LT-6 data.

Table 6-7. Summary of Long-Term Monitoring at Location LT-6

Date	Time (Hour Beginning)	1-Hour L_{eq} (dBA)	Difference from Loudest Hour (dB)
5-Mar-08	10:00:00	63	-1
	11:00:00	63	-1
	12:00:00	63	-1
	13:00:00	**64**	**0**
	14:00:00	**64**	**0**
	15:00:00	63	-1
	16:00:00	**64**	**0**
	17:00:00	63	-1
	18:00:00	63	-1
	19:00:00	63	-1
	20:00:00	62	-2
	21:00:00	62	-2
	22:00:00	62	-2
	23:00:00	60	-4
6-Mar-08	0:00:00	60	-4
	1:00:00	58	-6
	2:00:00	58	-6
	3:00:00	59	-5
	4:00:00	63	-1
	5:00:00	**64**	**0**
	6:00:00	62	-2
	7:00:00	61	-3
	8:00:00	**64**	**0**
	9:00:00	62	-2
	max	**64**	
	min	58	
Note: Worst-case noise hours are bolded			

Figure 6-6. Long-Term Monitoring at Location LT-6, March 5–6, 2008



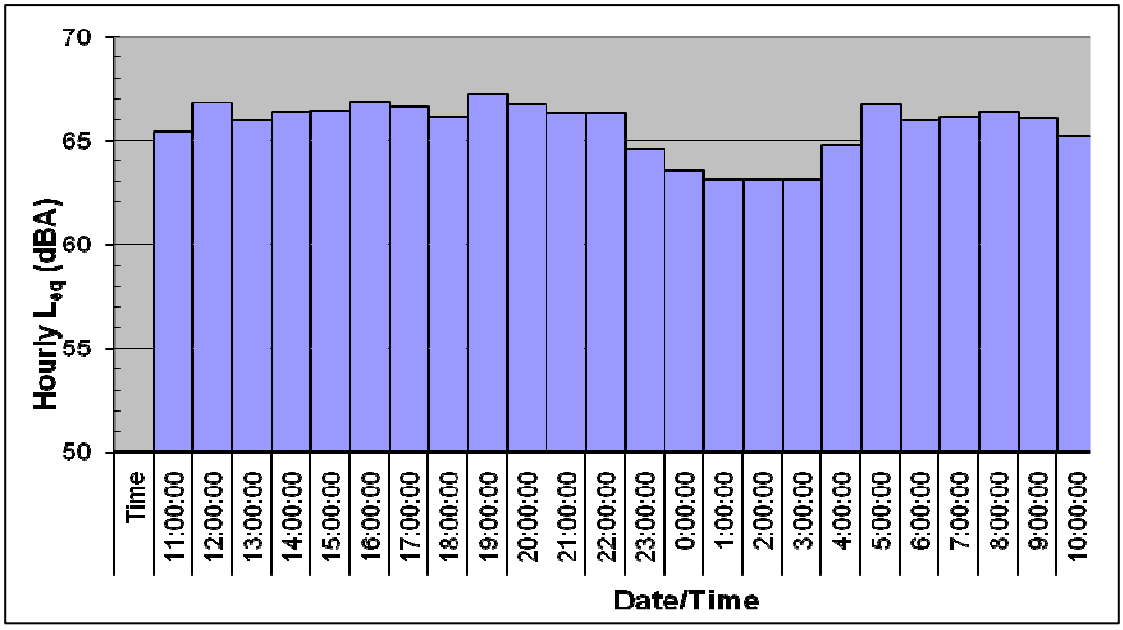
LT-7: LT-7 was located at Peralta Canyon Park (115 North Pinney Drive), just west of a row of residences on the south side of SR-91 east of Lakeview Avenue, approximately 50 feet from the SR-91 edge-of-pavement. The loudest-hour noise level measured was 67 dBA $L_{eq}(h)$ during the 12 p.m., 4 p.m. to 5 p.m., 7 p.m., 8 p.m., and 5 a.m. hours. Table 6-8 and Figure 6-7 summarize the results of the LT-7 data.

Table 6-8. Summary of Long-Term Monitoring at Location LT-7

Date	Time (Hour Beginning)	1-Hour L_{eq} (dBA)	Difference from Loudest Hour (dB)
5-Mar-08	11:00:00	65	-2
	12:00:00	**67**	**0**
	13:00:00	66	-1
	14:00:00	66	-1
	15:00:00	66	-1
	16:00:00	**67**	**0**
	17:00:00	**67**	**0**
	18:00:00	66	-1
	19:00:00	**67**	**0**
	20:00:00	**67**	**0**
	21:00:00	66	-1

Date	Time (Hour Beginning)	1-Hour L_{eq} (dBA)	Difference from Loudest Hour (dB)
	22:00:00	66	-1
	23:00:00	65	-2
6-Mar-08	0:00:00	64	-3
	1:00:00	63	-4
	2:00:00	63	-4
	3:00:00	63	-4
	4:00:00	65	-2
	5:00:00	**67**	**0**
	6:00:00	66	-1
	7:00:00	66	-1
	8:00:00	66	-1
	9:00:00	66	-1
	10:00:00	65	-2
	max	**67**	
	min	63	
Note: Worst-case noise hours are bolded			

Figure 6-7. Long-Term Monitoring at Location LT-7, March 5–6, 2008



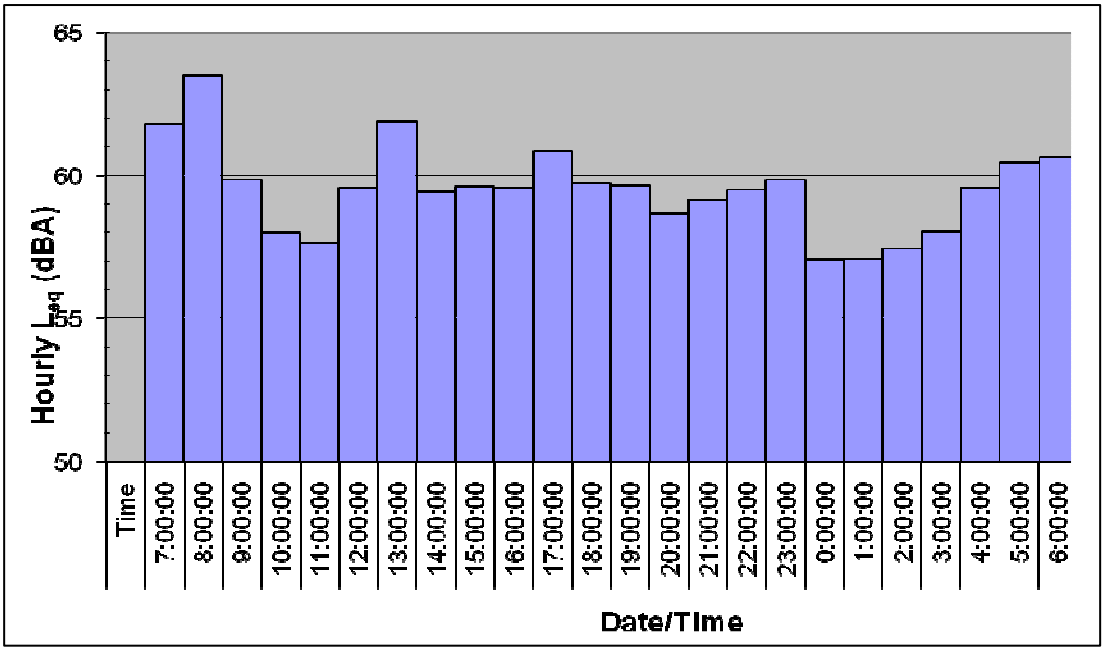
LT-8: LT-8 was located at a residence at 131 Deerfield Street, on the north side of SR-91 west of Lakeview Avenue, approximately 300 feet from the SR-91 edge-of-pavement.

The loudest-hour noise level measured was 64 dBA L_{eq}(h) during the 8 a.m. hour. Table 6-9 and Figure 6-8 summarize the results of the LT-8 data.

Table 6-9. Summary of Long-Term Monitoring at Location LT-8

Date	Time (Hour Beginning)	1-Hour L_{eq} (dBA)	Difference from Loudest Hour (dB)
11-Mar-08	7:00:00	62	-2
	8:00:00	**64**	**0**
	9:00:00	60	-4
	10:00:00	58	-6
	11:00:00	58	-6
	12:00:00	60	-4
	13:00:00	62	-2
	14:00:00	59	-5
	15:00:00	60	-4
	16:00:00	60	-4
	17:00:00	61	-3
	18:00:00	60	-4
	19:00:00	60	-4
	20:00:00	59	-5
	21:00:00	59	-5
	22:00:00	59	-5
	23:00:00	60	-4
12-Mar-08	0:00:00	57	-7
	1:00:00	57	-7
	2:00:00	57	-7
	3:00:00	58	-6
	4:00:00	60	-4
	5:00:00	60	-4
	6:00:00	61	-3
	max	**64**	
	min	57	
Note: Worst-case noise hours are bolded			

Figure 6-8. Long-Term Monitoring at Location LT-8, March 11–12, 2008



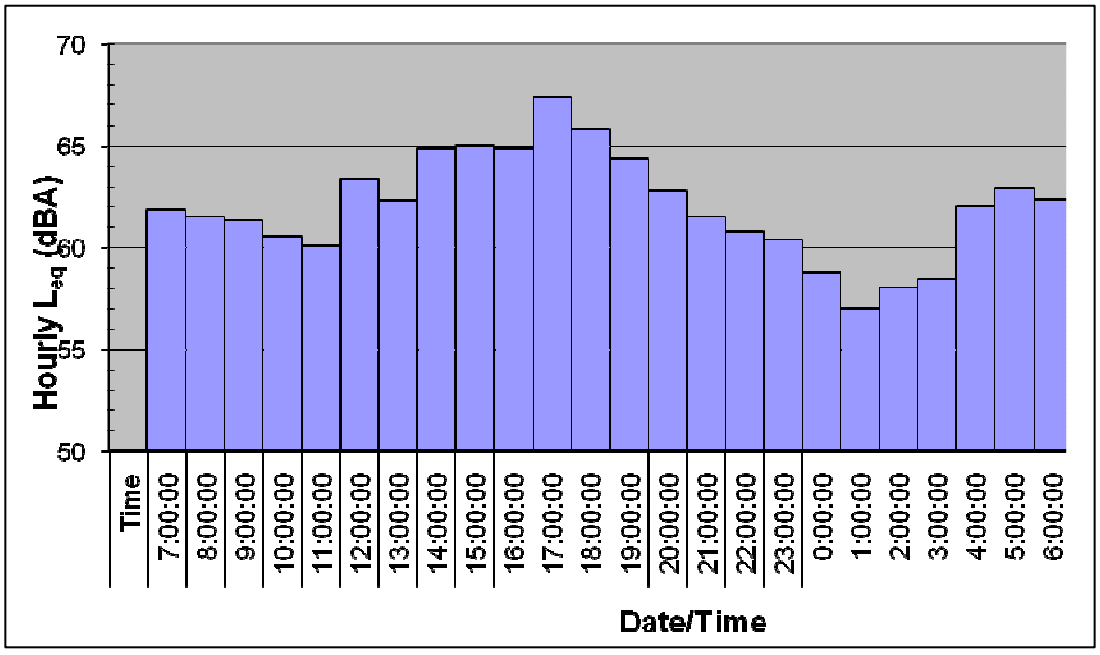
LT-9: LT-9 was located at a residence at 300 Lakedale Drive, on the north side of SR-91 west of Lakeview Avenue, approximately 120 feet from the SR-91 edge-of-pavement. The loudest-hour noise level measured was 67 dBA $L_{eq}(h)$ during the 5 p.m. hour. Table 6-10 and Figure 6-9 summarize the results of the LT-9 data.

Table 6-10. Summary of Long-Term Monitoring at Location LT-9

Date	Time (Hour Beginning)	1-Hour L_{eq} (dBA)	Difference from Loudest Hour (dB)
11-Mar-08	7:00:00	62	-5
	8:00:00	62	-5
	9:00:00	61	-6
	10:00:00	61	-6
	11:00:00	60	-7
	12:00:00	63	-4
	13:00:00	62	-5
	14:00:00	65	-2
	15:00:00	65	-2
	16:00:00	65	-2
	17:00:00	**67**	**0**

Date	Time (Hour Beginning)	1-Hour L_{eq} (dBA)	Difference from Loudest Hour (dB)
	18:00:00	66	-1
	19:00:00	64	-3
	20:00:00	63	-4
	21:00:00	62	-5
	22:00:00	61	-6
	23:00:00	60	-7
12-Mar-08	0:00:00	59	-8
	1:00:00	57	-10
	2:00:00	58	-9
	3:00:00	58	-9
	4:00:00	62	-5
	5:00:00	63	-4
	6:00:00	62	-5
	max	**67**	
	min	60	
Note: Worst-case noise hours are bolded			

Figure 6-9. Long-Term Monitoring at Location LT-9, March 11–12, 2008



6.2.3. Traffic Noise Model Calibration

TNM Version 2.5 was used to compare measured traffic noise levels to modeled noise levels at field measurement locations using traffic count data collected at the time of the noise measurements. Table 6-11 compares measured and modeled noise levels at each measurement location (see Figure 5-1). In general, good agreement (within 2 decibels) was achieved between the measured and modeled results. However, because of the relatively complex geometry (multiple existing barriers, terrain, or distances of several hundred or more feet) at some of the locations, differences between measured and predicted noise levels are larger than would otherwise be desirable. For each such instance, the noise model was checked thoroughly, and corrections were made as appropriate in order to achieve a higher level of accuracy. Following the adjustment phase, the differences greater than 1 decibel were rounded to whole numbers and utilized as K-factors for the subsequent modeling of existing and future peak-noise-hour traffic noise.

Table 6-11. Comparison of Measured to Modeled Sound Levels in the TNM Model

Measurement Position	Measured Sound Level (dBA)	Predicted Sound Level (dBA)	Measured minus Predicted (dB)
ST-1	65.8	66.7	-0.9
ST-2	71	73	-2
ST-3	66.4	73.1	-6.7
ST-4	62.7	66.1	-3.4
ST-5	58.5	61.8	-3.3
ST-6	64.7	63.9	0.8
ST-7	71.8	72	-0.2
ST-8	67.3	66.9	0.4
ST-9	58.4	58.6	-0.2
ST-10	62.5	56.7	5.8
ST-11	66.2	65	1.2
ST-12	67	67.6	-0.6
ST-14	68	65.4	2.6
ST-15	56.9	61.1	-4.2
ST-16	55.6	57.8	-2.2
ST-17	60.1	61.8	-1.7
ST-18	65.5	66.8	-1.3
ST-19	58.7	64	-5.3
ST-20	65.6	64.5	1.1
ST-21	64.8	67.1	-2.3

Measurement Position	Measured Sound Level (dBA)	Predicted Sound Level (dBA)	Measured minus Predicted (dB)
ST-22	59.4	62.9	-3.5
ST-23	56.7	59.2	-2.5
ST-24	56.1	63.2	-7.1
ST-25	53.3	57.4	-4.1
ST-26	51.5	57.7	-6.2
ST-27	55.6	61.1	-5.5
ST-28	59.5	60	-0.5
ST-29	60.9	67.8	-6.9
LT-1	69.1	73.4	-4.3
LT-2	68.9	66.4	2.5
LT-3	64.9	66	-1.1
LT-4	59.7	59.5	0.2
LT-5	63.3	62.1	1.2
LT-6	63.5	64	-0.5
LT-7	65.4	65.9	-0.5
LT-8	59.6	61.1	-1.5
LT-9	60.6	61.1	-0.5

6.2.4. Existing Modeled Noise Levels

Table B-1 in Appendix B presents the existing modeled noise levels at each receiver (the same modeled noise data for the existing scenario also appears in Tables B-2, B-3, B-4, and B-5).

Area A. As shown in Table B-1, existing peak-noise-hour traffic noise levels within Area A range from 58 to 67 dBA $L_{eq}(h)$. FHWA/Department NAC are exceeded at three modeled receptors, representative of 14 residential uses.

Area B. Existing peak-noise-hour traffic noise levels within Area B range from 61 to 62 dBA $L_{eq}(h)$. FHWA/Department NAC are not exceeded at any of the modeled receptors in this area.

Area C. Existing peak-noise-hour traffic noise levels within Area C vary from 55 to 66 dBA $L_{eq}(h)$. FHWA/Department NAC are exceeded at one modeled receptor, representative of 6 residential uses.

Area D. Existing peak-noise-hour traffic noise levels within Area D vary from 60 to 70 dBA $L_{eq}(h)$. FHWA/Department NAC are exceeded at nine modeled receptors, representative of 61 residential uses or residential equivalents.

Area E. Existing peak-noise-hour traffic noise levels within Area E vary from 55 to 61 dBA $L_{eq}(h)$. FHWA/Department NAC are not exceeded at any of the modeled receptors in this area.

Area F. Existing peak-noise-hour traffic noise levels within Area F vary from 58 to 73 dBA $L_{eq}(h)$. FHWA/Department NAC are exceeded at twelve modeled receptors, representative of 99 residential uses.

Area G. Existing peak-noise-hour traffic noise levels within Area G vary from 66 to 70 dBA $L_{eq}(h)$. FHWA/Department NAC are exceeded at four modeled receptors, representative of 60 residential uses.

Area H. Existing peak-noise-hour traffic noise levels within Area H vary from 59 to 75 dBA $L_{eq}(h)$. FHWA/Department NAC are exceeded at six modeled receptors, representative of 81 residential uses.

Chapter 7. Future Noise Environment, Impacts, and Considered Abatement

7.1. Future Noise Environment and Impacts

Tables B-1 through B-5 in Appendix B summarize the traffic noise modeling results for existing conditions and design-year conditions with and without the project. Predicted design-year with-project traffic noise levels are compared to existing conditions and to design-year without-project conditions. The comparison to existing conditions is included in the analysis to identify traffic noise impacts under 23 CFR 772. The comparison to without-project conditions indicates the direct effect of the project.

As stated in TeNS, modeling results are rounded to the nearest decibel before comparisons are made. In some cases, this can result in relative changes that may not appear intuitive. An example would be a comparison between sound levels of 64.4 and 64.5 dBA. The difference between these two values is 0.1 dB. However, after rounding, the difference is reported as 1 dB.

Modeling results in Table B-1 indicate that predicted traffic noise levels for the design-year with-project conditions approach or exceed the NAC of 67 dBA $L_{eq}(h)$ for Activity Category B land uses at residences within Areas A, C, D, F, and H. Category B land uses at the RV park within Area G also are also predicted to experience design-year with-project noise levels that approach or exceed the NAC of 67 dBA $L_{eq}(h)$. Additionally, Category B land uses at the school athletic field and park within Area D are predicted to experience design-year with-project noise levels that approach or exceed the NAC of 67 dBA $L_{eq}(h)$. Therefore, traffic noise impacts are predicted to occur at Activity Category B land uses within the project area, and noise abatement must be considered.

The results indicate that predicted traffic noise levels for the design-year with-project conditions do not approach or exceed the NAC of 67 dBA $L_{eq}(h)$ for Activity Category B land uses at residences within Areas B or E, or at Activity Category B land uses at the school athletic field in Area E. The NAC of 72 dBA $L_{eq}(h)$ for Activity Category C land uses within Area F is not approached or exceeded, nor is the NAC of 52 dBA $L_{eq}(h)$ interior exceeded for the hotel uses within Areas F and G.

7.2. Preliminary Noise Abatement Analysis

In accordance with 23 CFR 772, noise abatement is considered where noise impacts are predicted in areas of frequent human use that would benefit from a lowered noise level. Potential noise abatement measures identified in the Protocol include the following:

- avoiding the impact by using design alternatives, such as altering the horizontal and vertical alignment of the project;
- constructing noise barriers;
- acquiring property to serve as a buffer zone;
- using traffic management measures to regulate types of vehicles and speeds; and
- acoustically insulating public-use or nonprofit institutional structures.

All of these abatement options have been considered. However, because of the configuration and location of the project, abatement in the form of noise barriers is the only abatement that is considered feasible.

Each noise barrier has been evaluated for feasibility based on achievable noise reduction. For each noise barrier found to be acoustically feasible, reasonable cost allowances were calculated. Worksheets provided in Appendix C summarize the reasonable cost allowance calculations at the critical design receiver based on the allowance calculation procedure identified in the Protocol. Refer to the Protocol for the definition of the critical design receiver. Tables B-1 through B-5 in Appendix B summarize the results at receiver locations for fifteen noise barriers (Barriers NB-1 through NB-15) that have been evaluated in detail for this project. The considered noise barriers are shown in Figures B-1 through B-26, and the barriers found to be feasible are shown in Figures 7-1 through 7-11.

Background Noise. In Area H (eastbound side of SR-91 from Weir Canyon Road to SR-241), Santa Ana Canyon Road lies between the residences and the SR-91. In order to assess the potential effects of background noise (i.e., the contribution of Santa Ana Canyon Road to the noise environment in the area), the TNM model was used rather than noise measurements. The reason for this is that the influence of SR-91 was dominant and there was no location along Santa Ana Canyon Road where the traffic volumes were similar to those experienced in Area H and where SR-91 did not have a strong influence on the noise levels; the portions of Santa Ana Canyon Road where SR-91 noise was not

dominant carry substantially higher traffic volumes than in the area east of Weir Canyon Road.

Using the TNM model and traffic volume data for Santa Ana Canyon Road provided by the City of Anaheim, the noise from SR-91 and Santa Ana Canyon Road were separated by running TNM with SR-91 traffic data only and then with Santa Ana Canyon Road traffic data only. As shown in Table 7-1, the difference between SR-91 traffic noise levels and Santa Ana Canyon Road traffic noise levels was found to be over 10 decibels at all of the receptors except M-8, M-10, and M-11 (i.e., SR-91 traffic noise levels were 10 decibels or more above Santa Ana Canyon Road traffic noise). Thus, background noise from Santa Ana Canyon Road has a negligible effect on the overall traffic noise at the modeled receptors in Area H except at receivers M-8, M-10, and M-11. Because the NAC are not exceeded at receivers M-8, M-10, and M-11, noise abatement was not considered at these receivers.

Table 7-1. Background Noise from Santa Ana Canyon Road (dBA L_{eq}[h])

Receiver	Existing Peak-Hour SR-91 Only (No Santa Ana Canyon traffic)	Existing Peak-Hour Santa Ana Canyon Only (No SR-91 traffic)	Difference	Future With-Project SR-91 Only (No Santa Ana Canyon traffic)	Future With-Project Santa Ana Canyon Only (No SR-91 traffic)	Difference
M-7	73.9	55.3	18.6	74.2	55.3	18.9
ST-4	63.7	49.5	14.2	63.8	49.5	14.3
LT-1	74.6	54.3	20.3	75.1	54.3	20.8
ST-2	73.7	57.8	15.9	72.9	57.8	15.1
M-3	63	40.4	22.6	63.1	40.4	22.7
M-4	61.3	38.8	22.5	61.8	38.8	23
M-5	74.5	59.7	14.8	75.2	59.7	15.5
M-6	67.1	45.6	21.5	67.6	45.6	22
M-11	58.1	58.1	0	58.8	58.1	0.7
M-10	58	57.7	0.3	58.7	57.7	1
M-8	64.3	56.8	7.5	64.6	56.8	7.8
M-9	58.1	46	12.1	58.5	46	12.5

Reasonableness. For any noise barrier to be considered reasonable from a cost perspective, the estimated cost of the noise barrier should be equal to or less than the total cost allowance calculated for the barrier. The cost calculations of the noise barrier should include all items appropriate and necessary for construction of the barrier, such as traffic control, drainage modification, and retaining walls. Construction cost estimates are not provided in this NSR but are presented in the Noise Abatement Decision Report (NADR). The NADR is a design responsibility and is prepared to compile information from the NSR, other relevant environmental studies, and design considerations into a single, comprehensive document. The NADR is prepared by the project engineer after completion of the NSR and prior to publication of the draft environmental document. The NADR includes noise abatement construction cost estimates that have been prepared and signed by the project engineer based on site-specific conditions. Construction cost estimates are compared to reasonableness allowances in the NADR to identify which wall configurations are reasonable from a cost perspective.

The design of noise barriers presented in this report is preliminary and has been conducted at a level appropriate for environmental review and not for final design of the project. Preliminary information on the physical location, length, and height of noise barriers is provided in this report. If pertinent parameters change substantially during the final project design, preliminary noise barrier designs may be modified or eliminated from the final project. A final decision on the construction of the noise abatement will be made upon completion of the project design.

The following is a discussion of noise abatement considered for each evaluation area where traffic noise impacts are predicted.

7.2.1. Area A

The traffic noise modeling results in Table B-1 indicate that traffic noise levels at the residences in Area A are predicted to range from 58 to 66 dBA $L_{eq}(h)$ in the design year with the project. The results also indicate that the increase in noise between existing conditions and the design year is predicted to be -1 to 1 dB. Because the traffic noise level in the design year is predicted to approach or exceed the NAC of 67 dBA $L_{eq}(h)$, traffic noise impacts are predicted at residences in this area, and noise abatement must be considered. Receivers M-55, M-53, and M-46 represent a total of 14 residences in Area A. A detailed modeling analysis (Table B-1) was conducted for an increase in the height of the existing barrier (NB-1, located at the edge of the shoulder) from 14 feet to 16 feet and an extension of NB-1 on the east side (NB-1 Ext), as shown in Figures B-1 through B-4, and Figure B-6. Barrier heights in the range of 6 to 16 feet were evaluated in 2-foot

increments for NB-1 Ext. Table D-1 in Appendix D summarizes the results of the barrier analysis for each receiver location in Area A. Reasonableness allowance calculation sheets for this barrier are provided in Worksheets C-1A and C-1B in Appendix C. Table 7-2 summarizes the calculated noise reductions and reasonable allowances for each barrier height.

Table 7-2. Summary of Reasonableness Determination Data—Barrier NB-1EXT[a]

Predicted Sound Level without Barrier						
Critical Design Receiver: M-46						
Design Year Noise Level, dBA L_{eq}(h): 66						
Design Year Noise Level Minus Existing Noise Level: 0						
Design Year with Barrier	**6-Foot Barrier**	**8-Foot Barrier**	**10-Foot Barrier**	**12-Foot Barrier**	**14-Foot Barrier**	**16-Foot Barrier**
Barrier Noise Reduction, dB	NA	NA	NA	NA	5	6
Number of Benefited Residences	NA	NA	NA	NA	2	2
New Highway or More than 50% of Residences Predate 1978[b]	NA	NA	NA	NA	Yes	Yes
Reasonable Allowance Per Benefited Residence	NA	NA	NA	NA	$44,000	$46,000
Total Reasonable Allowance	NA	NA	NA	NA	$88,000	$92,000

Note: NA = Not applicable. Barrier does not provide 5 dB of noise reduction.

[a] An NADR will be prepared that will identify noise barrier construction cost information and the noise barriers that are reasonable from a cost perspective.

[b] This adjustment increases the abatement allowance by $10,000 if the project is new highway construction or if most of the benefited residences (more than 50%) existed before January 1, 1978.

7.2.2. Area B

The traffic noise modeling results in Table B-1 indicate that traffic noise levels at residences in Area B are predicted to range from 61 to 62 dBA L_{eq}(h) in the design year with the project, and that the increase in noise would be -1 to 0 dB in the design year. Because the traffic noise level in the design year is not predicted to approach or exceed the NAC of 67 dBA L_{eq}(h) or result in a substantial increase in noise, noise abatement does not need to be considered in this area.

7.2.3. Area C

The traffic noise modeling results in Table B-1 indicate that traffic noise levels at residences in Area C are predicted to range from 55 to 66 dBA $L_{eq}(h)$ in the design year with the project. The results also indicate that the increase in noise between existing conditions and the design year is predicted to be 0 to 1 dB. Because the traffic noise level in the design year is predicted to approach or exceed the NAC of 67 dBA $L_{eq}(h)$ traffic noise impacts are predicted at residences in this area, and noise abatement must be considered. Receiver LT-6 represents a total of 6 residences in Area C. A detailed modeling analysis (Table B-1) was conducted for an increase in the heights of the existing barriers in the area from 14 feet to 16 feet (NB-2A, located at the edge of the shoulder), and from 10 feet to 16 feet (NB-2B, located at the right-of-way), as shown in Figures B-6 through B-9. Barrier heights were evaluated in 2-foot increments. Table D-2 in Appendix D summarizes the results of the barrier analysis for each receiver location in Area C. Abatement was found to not be feasible because barrier insertion loss would be less than 5 dB; therefore, no reasonableness calculations were conducted for this area.

7.2.4. Area D

The traffic noise modeling results in Table B-2 indicate that traffic noise levels at residences in Area D are predicted to range from 60 to 71 dBA $L_{eq}(h)$ in the design year with the project. The results also indicate that the increase in noise between existing conditions and the design year is predicted to be 0 to 1 dB. Because the traffic noise level in the design year is predicted to approach or exceed the NAC of 67 dBA $L_{eq}(h)$, traffic noise impacts are predicted at residences and recreation/athletic field uses in this area, and noise abatement must be considered. Receivers M-45, ST-20, ST-21, ST-18, M-33, LT-7, M-32, M-31, M-30, and M-27 represent a total of 74 residences or residential equivalents in Area D. A detailed modeling analysis (Table B-2) was conducted for an increase in the height of the existing barrier (NB-3, located at the right-of-way) from 14 feet to 16 feet, and an extension of NB-3 on the west side (NB-3 Ext W), as shown in Figure B-5, and Figures B-7 through B-12. Barrier heights were evaluated in 2-foot increments. Table D-3 in Appendix D summarizes the results of the barrier analysis for each receiver location in Area D. Abatement was found to be not feasible for an increase in height of NB-3 because barrier insertion loss would be less than 5 dB; however, Barrier NB-3 Ext W was found to be feasible. Reasonableness allowance calculation sheets for this barrier are provided in Worksheets C-2A through C-2D in Appendix C. Table 7-3 summarizes the calculated noise reductions and reasonable allowances for each barrier height.

Table 7-3. Summary of Reasonableness Determination Data—Barrier NB-3 EXT W[a]

Predicted Sound Level without Barrier						
Critical Design Receiver: M-63						
Design Year Noise Level, dBA L_{eq}(h): 69						
Design Year Noise Level Minus Existing Noise Level: 1						
Design Year with Barrier	**6-Foot Barrier**	**8-Foot Barrier**	**10-Foot Barrier**	**12-Foot Barrier**	**14-Foot Barrier**	**16-Foot Barrier**
Barrier Noise Reduction, dB	NA	NA	5	5	5	6
Number of Benefited Residences	NA	NA	1	1	1	1
New Highway or More than 50% of Residences Predate 1978[b]	NA	NA	Yes	Yes	Yes	Yes
Reasonable Allowance Per Benefited Residence	NA	NA	$44,000	$44,000	$44,000	$46,000
Total Reasonable Allowance	NA	NA	$44,000	$44,000	$44,000	$46,000

Note: NA = Not applicable. Barrier does not provide 5 dB of noise reduction.

[a] An NADR will be prepared that will identify noise barrier construction cost information and the noise barriers that are reasonable from a cost perspective.

[b] This adjustment increases the abatement allowance by $10,000 if the project is new highway construction or if most of the benefited residences (more than 50%) existed before January 1, 1978.

7.2.5. Area E

The traffic noise modeling results in Table B-1 indicate that traffic noise levels at residences in Area E are predicted to range from 58 to 63 dBA L_{eq}(h) in the design year with the project, and that the increase in noise would be 1 to 3 dB in the design year. Because the traffic noise level in the design year is not predicted to approach or exceed the NAC of 67 dBA L_{eq}(h) or result in a substantial increase in noise, noise abatement does not need to be considered in this area.

7.2.6. Area F

The traffic noise modeling results in Table B-1 indicate that traffic noise levels at the residences in Area F are predicted to range from 59 to 74 dBA L_{eq}(h) in the design year with the project, and that the increase in noise would be 1 to 4 dB in the design year. Because the traffic noise level in the design year is predicted to approach or exceed the NAC of 67 dBA L_{eq}(h), traffic noise impacts are predicted at residences in this area, and noise abatement must be considered. Receivers LT-5, M-21, ST-12, M-20, M-19, M-18,

ST-11, M-17, M-15, ST-14, M-14, M-13, LT-3, ST-6, and M-12 represent a total of 129 residences in Area F.

The hotel use in Area F (represented by ST-7) does not have exterior noise-sensitive uses with an exposure to the freeway; the outdoor use areas at the hotel that are directly exposed to noise from traffic on SR-91 are parking areas. Parking areas are not considered areas of frequent human use that would benefit from a lowered noise level. The interior noise levels would be below the Activity Category E NAC of 52 dBA $L_{eq}(h)$ based on the noise measurements and modeling; therefore, noise abatement is not considered further for this receptor.

Detailed modeling analyses (Tables B-1 through B-5) were conducted for Area F for a range of noise barrier alternatives, as shown in Figures B-12 through B-20. Abatement for the residences in Area F was analyzed in the form of potentially constructing a noise barrier along the edge-of-shoulder (NB-4, Table B-1) or right-of-way (NB-5, Table B-2), or extending existing wall heights at the residential property line (i.e., at the existing "garden wall" location) (NB-6, Table B-3), 6 feet inside the Department property line (NB-7, Table B-4), or at the right-of-way with the barrier base elevation increased to the equivalent height of the adjacent berm elevation (NB-8, Table B-5). The barrier heights analyzed were from 6 feet to 16 feet, in 2-foot increments. The analysis indicates that abatement would be feasible (i.e., provide effective noise reduction at many or most representative receptors) for all five barrier alternatives. For example, the analysis indicates:

- an edge-of-shoulder noise barrier (NB-4) with a minimum height of 12 feet would be feasible to construct, benefitting an estimated 3 (with a 12-foot high barrier) to 129 (with a 16-foot high barrier) residential receptors;
- a right-of-way noise barrier (NB-5) with a minimum height of 14 feet would be feasible to construct, benefitting an estimated 17 (with a 14-foot high barrier) to 47(with a 16-foot high barrier) residential receptors;
- a residential property-line (i.e., at the existing "garden wall" location) noise barrier (NB-6) with a minimum height of 10 feet would be feasible to construct, benefitting an estimated 12 (with a 10-foot high barrier) to 61 (with a 16-foot high barrier) residential receptors;
- a noise barrier constructed 6 feet inside the right-of-way (NB-7) with a minimum height of 14 feet would be feasible to construct, benefitting an estimated 17 (with a 14-foot high barrier) to 42 (with a 16-foot high barrier) residential receptors; and

- a noise barrier constructed at the Department right-of-way with the barrier base elevation increased to the equivalent height of the adjacent berm elevation (NB-8) with a minimum height of 10 feet would be feasible to construct, benefitting an estimated 66 (with a 10-foot high barrier) to 105 (with a 16-foot high barrier) residential receptors.

Table D-4 in Appendix D summarizes the results of the NB-4 barrier analysis for each receiver location in Area F. Reasonableness allowance calculation sheets for NB-4 are provided in Worksheets C-3A and C-3C in Appendix C. Table 7-4 summarizes the calculated noise reductions and reasonable allowances for each barrier height of NB-4 found to be feasible.

Table 7-4. Summary of Reasonableness Determination Data—Barrier NB-4[a]

Predicted Sound Level without Barrier						
Critical Design Receiver: M-12						
Design Year Noise Level, dBA L_{eq}(h): 71						
Design Year Noise Level Minus Existing Noise Level: 4						
Design Year with Barrier	**6-Foot Barrier**	**8-Foot Barrier**	**10-Foot Barrier**	**12-Foot Barrier**	**14-Foot Barrier**	**16-Foot Barrier**
Barrier Noise Reduction, dB	NA	NA	NA	6	9	10
Number of Benefited Residences	NA	NA	NA	3	72	129
New Highway or More than 50% of Residences Predate 1978[b]	NA	NA	NA	Yes	Yes	Yes
Reasonable Allowance Per Benefited Residence	NA	NA	NA	$50,000	$52,000	$52,000
Total Reasonable Allowance	NA	NA	NA	$150,000	$3.744M	$6.708M

Note: NA = Not applicable. Barrier does not provide 5 dB of noise reduction.

[a] An NADR will be prepared that will identify noise barrier construction cost information and the noise barriers that are reasonable from a cost perspective.

[b] This adjustment increases the abatement allowance by $10,000 if the project is new highway construction or if most of the benefited residences (more than 50%) existed before January 1, 1978.

Table D-5 in Appendix D summarizes the results of the NB-5 barrier analysis for each receiver location in Area F. Reasonableness allowance calculation sheets for NB-5 are provided in Worksheets C-4A through C-4B in Appendix C. Table 7-5 summarizes the calculated noise reductions and reasonable allowances for each barrier height of NB-5 found to be feasible.

Table 7-5. Summary of Reasonableness Determination Data—Barrier NB-5[a]

Predicted Sound Level without Barrier						
Critical Design Receiver: M-20						
Design Year Noise Level, dBA L_{eq}(h): 74						
Design Year Noise Level Minus Existing Noise Level: 1						
Design Year with Barrier	**6-Foot Barrier**	**8-Foot Barrier**	**10-Foot Barrier**	**12-Foot Barrier**	**14-Foot Barrier**	**16-Foot Barrier**
Barrier Noise Reduction, dB	NA	NA	NA	NA	5	7
Number of Benefited Residences	NA	NA	NA	NA	17	47
New Highway or More than 50% of Residences Predate 1978[b]	NA	NA	NA	NA	Yes	Yes
Reasonable Allowance Per Benefited Residence	NA	NA	NA	NA	$46,000	$48,000
Total Reasonable Allowance	NA	NA	NA	NA	$782,000	$2.256M

Note: NA = Not applicable. Barrier does not provide 5 dB of noise reduction.

[a] An NADR will be prepared that will identify noise barrier construction cost information and the noise barriers that are reasonable from a cost perspective.

[b] This adjustment increases the abatement allowance by $10,000 if the project is new highway construction or if most of the benefited residences (more than 50%) existed before January 1, 1978.

Table D-6 in Appendix D summarizes the results of the NB-6 barrier analysis for each receiver location in Area F. Reasonableness allowance calculation sheets for NB-6 are provided in Worksheets C-5A through C-5D in Appendix C. Table 7-6 summarizes the calculated noise reductions and reasonable allowances for each barrier height of NB-6 found to be feasible.

Table 7-6. Summary of Reasonableness Determination Data—Barrier NB-6[a]

Predicted Sound Level without Barrier						
Critical Design Receiver: M-12						
Design Year Noise Level, dBA L_{eq}(h): 71						
Design Year Noise Level Minus Existing Noise Level: 4						
Design Year with Barrier	**6-Foot Barrier**	**8-Foot Barrier**	**10-Foot Barrier**	**12-Foot Barrier**	**14-Foot Barrier**	**16-Foot Barrier**
Barrier Noise Reduction, dB	NA	NA	5	6	7	7
Number of Benefited Residences	NA	NA	12	24	43	82
New Highway or More than 50% of Residences Predate 1978[b]	NA	NA	Yes	Yes	Yes	Yes
Reasonable Allowance Per Benefited Residence	NA	NA	$48,000	$50,000	$50,000	$50,000
Total Reasonable Allowance	NA	NA	$576,000	$1.200M	$2.150M	$4.100M

Note: NA = Not applicable. Barrier does not provide 5 dB of noise reduction.

[a] An NADR will be prepared that will identify noise barrier construction cost information and the noise barriers that are reasonable from a cost perspective.

[b] This adjustment increases the abatement allowance by $10,000 if the project is new highway construction or if most of the benefited residences (more than 50%) existed before January 1, 1978.

Table D-7 in Appendix D summarizes the results of the NB-7 barrier analysis for each receiver location in Area F. Reasonableness allowance calculation sheets for NB-7 are provided in Worksheets C-6A through C-6B in Appendix C. Table 7-7 summarizes the calculated noise reductions and reasonable allowances for each barrier height of NB-7 found to be feasible.

Table 7-7. Summary of Reasonableness Determination Data—Barrier NB-7[a]

Predicted Sound Level without Barrier						
Critical Design Receiver: M-20						
Design Year Noise Level, dBA L_{eq}(h): 74						
Design Year Noise Level Minus Existing Noise Level: 1						
Design Year with Barrier	**6-Foot Barrier**	**8-Foot Barrier**	**10-Foot Barrier**	**12-Foot Barrier**	**14-Foot Barrier**	**16-Foot Barrier**
Barrier Noise Reduction, dB	NA	NA	NA	NA	5	7
Number of Benefited Residences	NA	NA	NA	NA	17	42
New Highway or More than 50% of Residences Predate 1978[b]	NA	NA	NA	NA	Yes	Yes
Reasonable Allowance Per Benefited Residence	NA	NA	NA	NA	$46,000	$48,000
Total Reasonable Allowance	NA	NA	NA	NA	$782,000	$2.016M

Note: NA = Not applicable. Barrier does not provide 5 dB of noise reduction.

[a] An NADR will be prepared that will identify noise barrier construction cost information and the noise barriers that are reasonable from a cost perspective.

[b] This adjustment increases the abatement allowance by $10,000 if the project is new highway construction or if most of the benefited residences (more than 50%) existed before January 1, 1978.

Table D-8 in Appendix D summarizes the results of the NB-8 barrier analysis for each receiver location in Area F. Reasonableness allowance calculation sheets for NB-8 are provided in Worksheets C-7A through C-7D in Appendix C. Table 7-8 summarizes the calculated noise reductions and reasonable allowances for each barrier height of NB-8 found to be feasible.

Table 7-8. Summary of Reasonableness Determination Data—Barrier NB-8[a]

Predicted Sound Level without Barrier						
Critical Design Receiver: M-20						
Design Year Noise Level, dBA L_{eq}(h): 74						
Design Year Noise Level Minus Existing Noise Level: 1						
Design Year with Barrier	**6-Foot Barrier**	**8-Foot Barrier**	**10-Foot Barrier**	**12-Foot Barrier**	**14-Foot Barrier**	**16-Foot Barrier**
Barrier Noise Reduction, dB	NA	NA	5	6	7	12
Number of Benefited Residences	NA	NA	73	66	90	105
New Highway or More than 50% of Residences Predate 1978[b]	NA	NA	Yes	Yes	Yes	Yes
Reasonable Allowance Per Benefited Residence	NA	NA	$46,000	$48,000	$48,000	$52,000
Total Reasonable Allowance	NA	NA	$3.358M	$3.168M	$4.320M	$5.460M

Note: NA = Not applicable. Barrier does not provide 5 dB of noise reduction.

[a] An NADR will be prepared that will identify noise barrier construction cost information and the noise barriers that are reasonable from a cost perspective.

[b] This adjustment increases the abatement allowance by $10,000 if the project is new highway construction or if most of the benefited residences (more than 50%) existed before January 1, 1978.

7.2.7. Area G

The traffic noise modeling results in Table B-1 indicate that traffic noise levels at residences in Area G are predicted to range from 66 to 70 dBA L_{eq}(h) in the design year with the project, and that the increase in noise would be 0 dB in the design year. Because the traffic noise level in the design year is predicted to approach or exceed the applicable NAC of 67 dBA L_{eq}(h), traffic noise impacts are predicted at the recreational/RV uses in this area, and noise abatement must be considered. Receivers LT-2, M-2, ST-1, and M-1 represent a total of 15 residential equivalents in Area G.

A detailed modeling analysis (Table B-1) was conducted for two scenarios, as shown in Figure B-26: construction of a new edge-of-shoulder noise barrier (NB-9A) ranging from 6 feet to 16 feet, in 2-foot increments, at the western edge of the RV campground/ recreational area, and an increase (to a maximum of 16 feet) of the existing 12-foot high noise barrier (NB-9B). Abatement was found to not be feasible because barrier insertion loss would be less than 5 dB; therefore, no reasonableness calculations were conducted for this area.

7.2.8. Area H

The traffic noise modeling results in Table B-1 indicate that traffic noise levels at residences in Area H are predicted to range from 59 to 75 dBA L_{eq}(h) in the design year with the project, and that the increase in noise would be 0 dB in the design year. Because the traffic noise level in the design year is predicted to approach or exceed the applicable NAC of 67 dBA L_{eq}(h), traffic noise impacts are predicted at residential uses in this area, and noise abatement must be considered. Receivers M-58, M-7, M-6, M-5, LT-1, M-57, and ST-2 represent a total of 81residences in Area H.

A detailed modeling analysis (Tables B-1 through B-3) was conducted for Area H for a range of noise barrier alternatives, as shown in Figures B-22 and B-26. Abatement for the residences in Area H was analyzed in the form of potentially constructing noise barriers (one for the apartments as represented by M-58, M-7, M-6, M-5, M-4, M-3, LT-1, and M-57, and one for the single-family residence represented by ST-2) along the edge-of-shoulder (NB-10 and NB-11, Table B-1), right-of-way (NB-12 and NB-13, Table B-2), and at the residential property line (NB-14 and NB-15, Table B-3). The analysis indicates that for the apartment complex represented by receptors M-7, M-6, M-5, M-4, M-3, and LT-1:

- an edge-of-shoulder noise barrier (NB-10) with a minimum height of 12 feet would be feasible to construct, benefitting an estimated 24 (with a 12-foot high barrier) to 56 (with a 16-foot high barrier) residential receptors;
- a right-of-way noise barrier (NB-12) would not be feasible because of insufficient insertion loss; and
- a 6-, 8-, 10-, 12-, 14- or 16-foot residential property-line noise barrier (NB-14) would benefit an estimated 56 residential receptors.

The analysis for the single-family residence represented by ST-2 indicates that:

- a 6-, 8-, 10-, 12-, 14-, or 16-foot edge-of-shoulder noise barrier (NB-11) would provide acoustical benefit to 1 residential receptor;
- a 6-, 8-, 10-, 12-, 14-, or 16-foot right-of-way noise barrier (NB-13) would provide acoustical benefit to 1 residential receptor; and
- a 14 or 16-foot residential property-line noise barrier (NB-15) would provide acoustical benefit to 1 residential receptor.

Table D-10 in Appendix D summarizes the results of the NB-10 barrier analysis for each receiver location in Area H. Reasonableness allowance calculation sheets for NB-10 are provided in Worksheets C-8A through C-8C in Appendix C. Table 7-9 summarizes the calculated noise reductions and reasonable allowances for each barrier height of NB-10 found to be feasible.

Table 7-9. Summary of Reasonableness Determination Data—Barrier NB-10[a]

Predicted Sound Level without Barrier						
Critical Design Receiver: M-7						
Design Year Noise Level, dBA L_{eq}(h): 74						
Design Year Noise Level Minus Existing Noise Level: 0						
Design Year with Barrier	**6-Foot Barrier**	**8-Foot Barrier**	**10-Foot Barrier**	**12-Foot Barrier**	**14-Foot Barrier**	**16-Foot Barrier**
Barrier Noise Reduction, dB	NA	NA	NA	5	7	8
Number of Benefited Residences	NA	NA	NA	24	48	56
New Highway or More than 50% of Residences Predate 1978[b]	NA	NA	NA	Yes	Yes	Yes
Reasonable Allowance Per Benefited Residence	NA	NA	NA	$46,000	$48,000	$48,000
Total Reasonable Allowance	NA	NA	NA	$1.104 M	$2.304M	$2.688M

Note: NA = Not applicable. Barrier does not provide 5 dB of noise reduction.

[a] An NADR will be prepared that will identify noise barrier construction cost information and the noise barriers that are reasonable from a cost perspective.

[b] This adjustment increases the abatement allowance by $10,000 if the project is new highway construction or if most of the benefited residences (more than 50%) existed before January 1, 1978.

Table D-11 in Appendix D summarizes the results of the NB-11 barrier analysis for ST-2. Reasonableness allowance calculation sheets for NB-11 are provided in Worksheets C-9A through C-9F in Appendix C. Table 7-10 summarizes the calculated noise reductions and reasonable allowances for each barrier height of NB-11 found to be feasible.

Table 7-10. Summary of Reasonableness Determination Data—Barrier NB-11[a]

Predicted Sound Level without Barrier						
Critical Design Receiver: ST-2						
Design Year Noise Level, dBA L_{eq}(h): 74						
Design Year Noise Level Minus Existing Noise Level: 0						
Design Year with Barrier	**6-Foot Barrier**	**8-Foot Barrier**	**10-Foot Barrier**	**12-Foot Barrier**	**14-Foot Barrier**	**16-Foot Barrier**
Barrier Noise Reduction, dB	5	6	6	8	9	9
Number of Benefited Residences	1	1	1	1	1	1
New Highway or More than 50% of Residences Predate 1978[b]	Yes	Yes	Yes	Yes	Yes	Yes
Reasonable Allowance Per Benefited Residence	$46,000	$48,000	$48,000	$48,000	$50,000	$50,000
Total Reasonable Allowance	$46,000	$48,000	$48,000	$48,000	$50,000	$50,000

Note: NA = Not applicable. Barrier does not provide 5 dB of noise reduction.

[a] An NADR will be prepared that will identify noise barrier construction cost information and the noise barriers that are reasonable from a cost perspective.

[b] This adjustment increases the abatement allowance by $10,000 if the project is new highway construction or if most of the benefited residences (more than 50%) existed before January 1, 1978.

Table D-13 in Appendix D summarizes the results of the NB-13 barrier analysis for each receiver location in Area H. Reasonableness allowance calculation sheets for NB-13 are provided in Worksheets C-10A through C-10F in Appendix C. Table 7-11 summarizes the calculated noise reductions and reasonable allowances for each barrier height of NB-13 found to be feasible.

Table 7-11. Summary of Reasonableness Determination Data—Barrier NB-13[a]

Predicted Sound Level without Barrier						
Critical Design Receiver: ST-2						
Design Year Noise Level, dBA L_{eq}(h): 74						
Design Year Noise Level Minus Existing Noise Level: 0						
Design Year with Barrier	**6-Foot Barrier**	**8-Foot Barrier**	**10-Foot Barrier**	**12-Foot Barrier**	**14-Foot Barrier**	**16-Foot Barrier**
Barrier Noise Reduction, dB	5	5	7	7	8	9
Number of Benefited Residences	1	1	1	1	1	1
New Highway or More than 50% of Residences Predate 1978[b]	Yes	Yes	Yes	Yes	Yes	Yes
Reasonable Allowance Per Benefited Residence	$46,000	$46,000	$48,000	$48,000	$48,000	$50,000
Total Reasonable Allowance	$46,000	$46,000	$48,000	$48,000	$48,000	$50,000

Note: NA = Not applicable. Barrier does not provide 5 dB of noise reduction.

[a] An NADR will be prepared that will identify noise barrier construction cost information and the noise barriers that are reasonable from a cost perspective.

[b] This adjustment increases the abatement allowance by $10,000 if the project is new highway construction or if most of the benefited residences (more than 50%) existed before January 1, 1978.

Table D-14 in Appendix D summarizes the results of the NB-14 barrier analysis for each receiver location in Area H. Reasonableness allowance calculation sheets for NB-14 are provided in Worksheets C-11A through C-11F in Appendix C. Table 7-12 summarizes the calculated noise reductions and reasonable allowances for each barrier height of NB-15 found to be feasible.

Table 7-12. Summary of Reasonableness Determination Data—Barrier NB-14[a]

Predicted Sound Level without Barrier						
Critical Design Receiver: LT-1						
Design Year Noise Level, dBA L_{eq}(h): 75						
Design Year Noise Level Minus Existing Noise Level: 0						
Design Year with Barrier	**6-Foot Barrier**	**8-Foot Barrier**	**10-Foot Barrier**	**12-Foot Barrier**	**14-Foot Barrier**	**16-Foot Barrier**
Barrier Noise Reduction, dB	10	12	14	15	16	17
Number of Benefited Residences	56	56	56	56	56	56
New Highway or More than 50% of Residences Predate 1978[b]	Yes	Yes	Yes	Yes	Yes	Yes
Reasonable Allowance Per Benefited Residence	$52,000	$54,000	$54,000	$54,000	$54,000	$54,000
Total Reasonable Allowance	$2.912 M	$3.024 M	$3.024 M	$3.024 M	$3.024 M	$3.024 M

Note: NA = Not applicable. Barrier does not provide 5 dB of noise reduction.

[a] An NADR will be prepared that will identify noise barrier construction cost information and the noise barriers that are reasonable from a cost perspective.

[b] This adjustment increases the abatement allowance by $10,000 if the project is new highway construction or if most of the benefited residences (more than 50%) existed before January 1, 1978.

Table D-15 in Appendix D summarizes the results of the NB-15 barrier analysis for ST-2. Reasonableness allowance calculation sheets for NB-15 are provided in Worksheets C-12A and C-12B in Appendix C. Table 7-13 summarizes the calculated noise reductions and reasonable allowances for each barrier height of NB-15 found to be feasible.

Table 7-13. Summary of Reasonableness Determination Data—Barrier NB-15[a]

Predicted Sound Level without Barrier						
Critical Design Receiver: ST-2						
Design Year Noise Level, dBA L_{eq}(h): 74						
Design Year Noise Level Minus Existing Noise Level: 0						
Design Year with Barrier	**6-Foot Barrier**	**8-Foot Barrier**	**10-Foot Barrier**	**12-Foot Barrier**	**14-Foot Barrier**	**16-Foot Barrier**
Barrier Noise Reduction, dB	NA	NA	NA	NA	5	5
Number of Benefited Residences	NA	NA	NA	NA	1	1
New Highway or More than 50% of Residences Predate 1978[b]	NA	NA	NA	NA	Yes	Yes
Reasonable Allowance Per Benefited Residence	NA	NA	NA	NA	$46,000	$46,000
Total Reasonable Allowance	NA	NA	NA	NA	$46,000	$46,000

Note: NA = Not applicable. Barrier does not provide 5 dB of noise reduction.

[a] An NADR will be prepared that will identify noise barrier construction cost information and the noise barriers that are reasonable from a cost perspective.

[b] This adjustment increases the abatement allowance by $10,000 if the project is new highway construction or if most of the benefited residences (more than 50%) existed before January 1, 1978.

Chapter 8. Construction Noise

During construction of the project, noise from construction activities may intermittently dominate the noise environment in the immediate area of construction. Construction noise is regulated by Department Standard Specifications Section 7-1.01I, "Sound Control Requirements," which states that noise levels generated during construction will comply with applicable local, state, and federal regulations, and that all equipment will be fitted with adequate mufflers according to the manufacturers' specifications.

Table 8-1 summarizes noise levels produced by construction equipment that is commonly used on roadway construction projects. Construction equipment is expected to generate noise levels ranging from 70 to 90 dB at a distance of 50 feet, and noise produced by construction equipment would be reduced over distance at a rate of about 6 dB per doubling of distance.

Table 8-1. Construction Equipment Noise

Equipment	Maximum Noise Level (dBA at 50 feet)
Scrapers	89
Bulldozers	85
Heavy Trucks	88
Backhoe	80
Pneumatic Tools	85
Concrete Pump	82
Source: Federal Transit Administration 1995.	

No adverse noise impacts from construction are anticipated because construction would be conducted in accordance with Department Standard Specifications Section 7-1.01I and applicable local noise standards. Construction noise would be short-term, intermittent, and overshadowed by local traffic noise. Further, implementing the following measures would minimize the temporary noise impacts from construction:

- All equipment will have sound-control devices that are no less effective than those provided on the original equipment. No equipment will have an unmuffled exhaust.
- As directed by The Department, the contractor will implement appropriate additional noise mitigation measures, including changing the location of stationary construction equipment, turning off idling equipment, rescheduling construction activity,

notifying adjacent residents in advance of construction work, and installing acoustic barriers around stationary construction noise sources.

Chapter 9. References

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Federal Transit Administration. 1995. *Transit noise and vibration impact assessment.* (DOT-T-95-16.) Office of Planning, Washington, DC. Prepared by Harris Miller Miller & Hanson, Inc. Burlington, MA.

Internet: Freeway Performance Measurement System (PeMS, v. 8.0). 3/14/08. Traffic data for on-ramps, off-ramps, and SR-241 connectors. https://pems.eecs.berkeley.edu/

E-mail Contacts: Kennedy, David. 2/11/08. Subject: Whether any planned, designed and programmed undeveloped lands are near the project site, and traffic counts for Santa Ana Canyon Road. City of Anaheim Public Works/Traffic Engineering. DKennedy@anaheim.net. Result/Action: No planned, designed and programmed undeveloped lands within 1,000 feet, and traffic counts were obtained.

Appendix A Traffic Data

This appendix contains tables presenting the traffic data for existing conditions, design year conditions without the project, and design year conditions with the project.

Table A-1. Traffic Data for Existing and Design Year No-Project Conditions

Roadway	Segment	Number of Lanes	Total Volume Peak Hour Volume	Auto (%)	Medium Trucks (%)	Heavy Trucks (%)	Buses (%)	Motorcycles (%)	Speed (A/MT/HT/ B/MC)
Mainline									
SR-91 eastbound	SR-55 to Lakeview Avenue	5 (plus 1 aux. Lane off at Lakeview)	1,900 vehicles per hour per lane (vphpl)	92.1	3.0%	4.3	0.2	0.4	65/65/60/ 60/65
SR-91 eastbound	Lakeview Avenue to Imperial Highway	5	1,900 vphpl	92.1	3.0%	4.3	0.2	0.4	65/65/60/ 60/65
SR-91 eastbound	Imperial Highway to Weir Canyon Road	4	1,900 vphpl	92.1	3.0%	4.3	0.2	0.4	65/65/60/ 60/65
SR-91 eastbound	Weir Canyon Road to SR-241	4 (plus 1 aux. Lane off at SR-241)	1,900 vphpl	92.1	3.0%	4.3	0.2	0.4	65/65/60/ 60/65
SR-91 westbound	SR-241 to Weir Canyon Road	4 (plus 1 aux. Lane off at Weir Canyon Road)	1,900 vphpl	92.1	3.0%	4.3	0.2	0.4	65/65/60/ 60/65
SR-91 westbound	Weir Canyon Road to Imperial Highway	4	1,900 vphpl	92.1	3.0%	4.3	0.2	0.4	65/65/60/ 60/65
SR-91 westbound	Imperial Highway to Lakeview Avenue	5	1,900 vphpl	92.1	3.0%	4.3	0.2	0.4	65/65/60/ 60/65
SR-91 westbound	Lakeview Avenue to SR-241	5	1,900 vphpl	92.1	3.0%	4.3	0.2	0.4	65/65/60/ 60/65
HOV Lanes									
SR-91 eastbound	SR-55 to SR-241	2	1500 vphpl	100.0	0	0	0	0	65
SR-91 westbound	SR-241 to SR-55	2	1500 vphpl	100.0	0	0	0	0	65

Table A-1. Continued

Roadway	Segment	Number of Lanes	Total Volume Peak Hour Volume	Auto (%)	Medium Trucks (%)	Heavy Trucks (%)	Buses (%)	Motorcycles (%)	Speed (A/MT/HT/ B/MC)
On/Off-Ramps									
EB SR-91 off	at Lakeview Avenue	1	998	92.1	3.0%	4.3	0.2	0.4	65/65/60
EB SR-91 on loop	at Lakeview Avenue	1	131	92.1	3.0%	4.3	0.2	0.4	10–65/65/ 60
EB SR-91 on	at Lakeview Avenue	1	14	92.1	3.0%	4.3	0.2	0.4	10–65/65/ 60
EB SR-91 off	at Imperial Highway	1	1308	92.1	3.0%	4.3	0.2	0.4	65/65/60
EB SR-91 on loop	at Imperial Highway	1	131	92.1	3.0%	4.3	0.2	0.4	10–65/65/ 60
EB SR-91 on	at Imperial Highway	1	111	92.1	3.0%	4.3	0.2	0.4	10–65/65/ 60
EB SR-91 on	at Weir Canyon Road	1	487	92.1	3.0%	4.3	0.2	0.4	10–65/65/ 60
EB SR-91 connector	to SB SR-241	2	201	92.1	3.0%	4.3	0.2	0.4	65/65/60
NB SR-241 connector	to WB SR-91	2	689	92.1	3.0%	4.3	0.2	0.4	65/65/60
WB SR-91 off	at Weir Canyon Road	1	1132	92.1	3.0%	4.3	0.2	0.4	65/65/60
WB SR-91 on loop	At Weir Canyon Road	1	683	92.1	3.0%	4.3	0.2	0.4	
WB SR-91 off	at Imperial Highway	1	1308	92.1	3.0%	4.3	0.2	0.4	65/65/60
WB SR-91 on loop	at Imperial Highway	1	131	92.1	3.0%	4.3	0.2	0.4	10–65/65/ 60
WB SR-91 on	at Imperial Highway	1	111	92.1	3.0%	4.3	0.2	0.4	10–65/65/ 60
WB SR-91 off	at Lakeview Avenue	1	998	92.1	3.0%	4.3	0.2	0.4	65/65/60
WB SR-91 on loop	at Lakeview Avenue	1	131	92.1	3.0%	4.3	0.2	0.4	10–65/65/ 60

Table A-1. Continued

Roadway	Segment	Number of Lanes	Total Volume Peak Hour Volume	Auto (%)	Medium Trucks (%)	Heavy Trucks (%)	Buses (%)	Motorcycles (%)	Speed (A/MT/HT/ B/MC)
WB SR-91 on	at Lakeview Avenue	1	14	92.1	3.0%	4.3	0.2	0.4	10–65/65/ 60
Surface Streets									
Santa Ana Canyon Road	West of Lakeview Ave	4	282	97.9%	1.4%	0.7%	0.0	0.0	45/45/45/ 0/0/
Santa Ana Canyon Road	East of Weir Canyon Road	6 lanes/ 2 lanes	474	97.9%	1.4%	0.7%	0.0	0.0	45/45/40/ 0/0
Notes: Mainline and HOV lane volumes represent peak-noise-hour (LOS D/E) traffic conditions, in which traffic volumes are high but freely flowing. On-ramp, off-ramp, and connector volumes derived from Freeway Performance Measurement System (PeMS) database, using a 3-month average for the typical PM peak-hour volume time period (i.e., 1600 hours). Surface street data derived from traffic count data supplied by City of Anaheim traffic engineering staff.									

Table A-2. Traffic Data for Design Year With-Project Conditions

Roadway	Segment	Number of Lanes	Total Volume Peak Hour Volume	Auto (%)	Medium Trucks (%)	Heavy Trucks (%)	Buses %	Motorcycles (%)	Speed (A/MT/HT/ B/MC)
Mainline									
SR-91 eastbound	SR-55 to Lakeview Avenue	6 (plus 1 aux. Lane off at Lakeview)	1,900 vehicles per hour per lane (vphpl)	92.1	3.0%	4.3	0.2	0.4	65/65/60/ 60/65
SR-91 eastbound	Lakeview Avenue to Imperial Highway	6	1,900 vphpl	92.1	3.0%	4.3	0.2	0.4	65/65/60/ 60/65
SR-91 eastbound	Imperial Highway to Weir Canyon Road	6	1,900 vphpl	92.1	3.0%	4.3	0.2	0.4	65/65/60/ 60/65
SR-91 eastbound	Weir Canyon Road to SR-241	5 (plus 1 aux. Lane off at SR-241)	1,900 vphpl	92.1	3.0%	4.3	0.2	0.4	65/65/60/ 60/65
SR-91 westbound	SR-241 to Weir Canyon Road	5 (plus 1 aux. Lane off at Weir Canyon Road)	1,900 vphpl	92.1	3.0%	4.3	0.2	0.4	65/65/60/ 60/65
SR-91 westbound	Weir Canyon Road to Imperial Highway	6	1,900 vphpl	92.1	3.0%	4.3	0.2	0.4	65/65/60/ 60/65
SR-91 westbound	Imperial Highway to Lakeview Avenue	5	1,900 vphpl	92.1	3.0%	4.3	0.2	0.4	65/65/60/ 60/65
SR-91 westbound	Lakeview Avenue to SR-241	5	1,900 vphpl	92.1	3.0%	4.3	0.2	0.4	65/65/60/ 60/65
HOV Lanes									
SR-91 eastbound	SR-55 to SR-241	2	1500 vphpl	100.0	0	0	0	0	65
SR-91 westbound	SR-241 to SR-55	2	1500 vphpl	100.0	0	0	0	0	65

Table A-2. Continued

Roadway	Segment	Number of Lanes	Total Volume Peak Hour Volume	Auto (%)	Medium Trucks (%)	Heavy Trucks (%)	Buses %	Motorcycles (%)	Speed (A/MT/HT/ B/MC)
On/Off-Ramps									
EB SR-91 off	at Lakeview Avenue	2	998	92.1	3.0%	4.3	0.2	0.4	65/65/60
EB SR-91 on loop	at Lakeview Avenue	1	131	92.1	3.0%	4.3	0.2	0.4	10–65/65/ 60
EB SR-91 on	at Lakeview Avenue	1	14	92.1	3.0%	4.3	0.2	0.4	10–65/65/ 60
EB SR-91 off	at Imperial Highway	2	1308	92.1	3.0%	4.3	0.2	0.4	65/65/60
EB SR-91 on loop	at Imperial Highway	1	131	92.1	3.0%	4.3	0.2	0.4	10–65/65/ 60
EB SR-91 on	at Imperial Highway	1	111	92.1	3.0%	4.3	0.2	0.4	10–65/65/ 60
EB SR-91 on	at Weir Canyon Road	1	487	92.1	3.0%	4.3	0.2	0.4	10–65/65/ 60
EB SR-91 connector	to SB SR-241	2	201	92.1	3.0%	4.3	0.2	0.4	65/65/60
NB SR-241 connector	to WB SR-91	2	689	92.1	3.0%	4.3	0.2	0.4	65/65/60
WB SR-91 off	at Weir Canyon Road	2	1132	92.1	3.0%	4.3	0.2	0.4	65/65/60
WB SR-91 on loop	At Weir Canyon Road	1	683	92.1	3.0%	4.3	0.2	0.4	
WB SR-91 off	at Imperial Highway	1	1308	92.1	3.0%	4.3	0.2	0.4	65/65/60
WB SR-91 on loop	at Imperial Highway	1	131	92.1	3.0%	4.3	0.2	0.4	10–65/65/ 60
WB SR-91 on	at Imperial Highway	1	111	92.1	3.0%	4.3	0.2	0.4	10–65/65/ 60

Table A-2. Continued

Roadway	Segment	Number of Lanes	Total Volume Peak Hour Volume	Auto (%)	Medium Trucks (%)	Heavy Trucks (%)	Buses %	Motorcycles (%)	Speed (A/MT/HT/ B/MC)
WB SR-91 off	at Lakeview Avenue	1	998	92.1	3.0%	4.3	0.2	0.4	65/65/60
WB SR-91 on loop	at Lakeview Avenue	2	131	92.1	3.0%	4.3	0.2	0.4	10–65/65/ 60
WB SR-91 on	at Lakeview Avenue	1	14	92.1	3.0%	4.3	0.2	0.4	10–65/65/ 60
Surface Streets									
Santa Ana Canyon Road	West of Lakeview Ave	4	282	97.9%	1.4%	0.7%	0.0	0.0	45/45/45/ 0/0/
Santa Ana Canyon Road	East of Weir Canyon Road	6 lanes / 2 lanes	474	97.9%	1.4%	0.7%	0.0	0.0	45/45/40/ 0/0/
Notes: Mainline and HOV lane volumes represent peak-noise-hour (LOS D/E) traffic conditions, in which traffic volumes are high but freely flowing. On-ramp, off-ramp, and connector volumes derived from Freeway Performance Measurement System (PeMS) database, using a 3-month average for the typical PM peak-hour volume time period (i.e., 1600 hours). Surface street data derived from traffic count data supplied by City of Anaheim traffic engineering staff.									

Appendix B Predicted Future Noise Levels and Noise Barrier Analysis

Tables B-1 through B-5 summarizes the traffic noise modeling results for existing and design-year conditions with and without the project. These tables also compare the predicted noise reductions by barrier height for each noise barrier analyzed.

Table B-1: Traffic Noise Levels for Existing, Future without Project, Future with Project and Future with Considered Noise Barrier at Edge-of-Shoulder

Receiver I.D.	Area	Barrier I.D.	Land Use / Activity Category (NAC)	Number of Dwelling Units	Existing Noise Level $L_{eq}(h)$, dBA	SR-91 Future Worst Hour Noise Levels - $L_{eq}(h)$, dBA																					Break-Line-of-Sight Height [a]
						Design Year Noise Level without Project $L_{eq}(h)$, dBA	Design Year Noise Level with Project, $L_{eq}(h)$, dBA	Design Year Noise Level with Project Minus Design Year Noise Level without Project Conditions $L_{eq}(h)$, dBA	Design Year Noise Level with Project Minus Existing Conditions $L_{eq}(h)$, dBA	Impact Type	Noise Prediction with Barrier at Edge-of-Shoulder, Barrier Insertion Loss (I.L.), and Number of Benefited Receivers (NBR)															
											6 feet			8 feet			10 feet			12 feet			14 feet			16 feet		
											$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	
ST-26	Area A: Westbound side of SR-91 west of Lakeview Avenue	NB-1	Residential / Activity Category B (67)	11	58	58	58	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	57	1	0	12'
M-54		NB-1		6	59	59	59	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	59	0	0	12'
M-56		NB-1		12	65	65	65	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	64	1	0	12'
M-55		NB-1		7	67	67	66	-1[d]	-1[d]	A/E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	66	0	0	12'
M-53		NB-1		5	66	66	66	0	0	A/E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	65	1	0	12'
M-52		NB-1		3	64	64	64	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	63	1	0	12'
M-50		NB-1		3	64	64	64	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	63	1	0	12'
LT-8		NB-1		4	62	62	62	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	61	1	0	12'
M-51		NB-1		4	58	58	58	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	57	1	0	12'
M-48		NB-1		3	64	64	64	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	63	1	0	12'
M-47		NB-1 EXT		4	60	60	60	0	0	None	60	0	0	60	0	0	60	0	0	60	0	0	59	1	0	59	1	0	12'
LT-9		NB-1 EXT		3	62	62	63	1	1	None	61	2	0	61	2	0	61	2	0	60	3	0	60	3	0	59	4	0	12'
M-46		NB-1 EXT		2	66	66	66	0	0	A/E	65	1	0	65	1	0	63	3	0	62	4	0	61	5	2	60	6	2	12'
M-67		NB-1 EXT		1	63	63	63	0	0	None	63	0	0	63	0	0	63	0	0	63	0	0	63	0	0	62	1	0	12'
M-68		NB-1 EXT		1	60	60	61	1	1	None	61	0	0	61	0	0	61	0	0	60	1	0	60	1	0	60	1	0	12'
M-69		NB-1 EXT		1	59	59	60	1	1	None	60	0	0	60	0	0	60	0	0	60	0	0	60	0	0	60	0	0	12'
M-70		NB-1 EXT		1	60	60	61	1	1	None	60	1	0	60	1	0	60	1	0	60	1	0	60	1	0	60	1	0	12'
M-71		NB-1 EXT		1	59	59	60	1	1	None	60	0	0	60	0	0	60	0	0	60	0	0	60	0	0	60	0	0	12'
M-72		NB-1 EXT		1	59	59	59	0	0	None	59	0	0	59	0	0	59	0	0	59	0	0	59	0	0	59	0	0	12'
ST-27		NB-1 EXT		3	63	63	63	0	0	None	62	1	0	62	1	0	62	1	0	62	1	0	62	1	0	61	2	0	12'
M-65		NB-1 EXT		2	64	64	65	1	1	None	65	0	0	65	0	0	65	0	0	65	0	0	65	0	0	64	1	0	12'
M-66		NB-1 EXT		2	62	62	63	1	1	None	63	0	0	63	0	0	63	0	0	63	0	0	62	1	0	62	1	0	12'
ST-29	Area B: Eastbound side of SR-91 west of Lakeview Avenue	—	Residential / Activity Category B (67)	6	62	62	61	-1[d]	-1[d]	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ST-28		—		8	61	61	61	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-49		—		3	62	62	62	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-42	Area C: Westbound side of SR-91 east of Lakeview Avenue	NB-2B	Residential / Activity Category B (67)	20	57	57	57	0	0	None	—	—	—	—	—	—	57	0	0	57	0	0	56	1	0	56	1	0	12'
M-41		NB-2B		5	61	61	61	0	0	None	—	—	—	—	—	—	61	0	0	60	1	0	59	2	0	58	3	0	12'
ST-22		NB-2A		5	60	60	60	0	0	None	—	—	—	—	—	—	60	0	0	59	1	0	58	2	0	57	3	0	10'

Table B-1. Continued

Receiver I.D.	Area	Barrier I.D.	Land Use / Activity Category (NAC)	Number of Dwelling Units	Existing Noise Level $L_{eq}(h)$, dBA	SR-91 Future Worst Hour Noise Levels - $L_{eq}(h)$, dBA																					Break-Line-of-Sight Height [a]
						Design Year Noise Level without Project $L_{eq}(h)$, dBA	Design Year Noise Level with Project, $L_{eq}(h)$, dBA	Design Year Noise Level with Project Minus Design Year Noise Level without Project Conditions $L_{eq}(h)$, dBA	Design Year Noise Level with Project Minus Existing Conditions $L_{eq}(h)$, dBA	Impact Type	Noise Prediction with Barrier at Edge-of-Shoulder, Barrier Insertion Loss (I.L.), and Number of Benefited Receivers (NBR)															
											6 feet			8 feet			10 feet			12 feet			14 feet			16 feet			
											$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	
LT-6		NB-2A		6	66	66	66	0	0	A/E	—	—	—	—	—	—	66	0	0	66	0	0	66	0	0	65	1	0	10'
ST-24		NB-2A		6	58	58	58	0	0	None	—	—	—	—	—	—	58	0	0	58	0	0	58	0	0	57	1	0	10'
M-35		NB-2A		12	58	58	58	0	0	None	—	—	—	—	—	—	58	0	0	58	0	0	58	0	0	57	1	0	10'
M-40		NB-2B		4	58	58	59	1	1	None	—	—	—	—	—	—	59	0	0	58	1	0	57	2	0	57	2	0	16'
M-39		NB-2A		3	59	59	59	0	0	None	—	—	—	—	—	—	59	0	0	58	1	0	57	2	0	57	2	0	16'
M-38		NB-2A		4	60	60	60	0	0	None	—	—	—	—	—	—	60	0	0	60	0	0	60	0	0	59	1	0	16'
ST-23		NB-2A		3	59	59	59	0	0	None	—	—	—	—	—	—	59	0	0	59	0	0	59	0	0	59	0	0	14'
M-36		NB-2A		3	59	59	59	0	0	None	—	—	—	—	—	—	59	0	0	59	0	0	59	0	0	59	0	0	14'
M-34		NB-2A		4	61	61	61	0	0	None	—	—	—	—	—	—	61	0	0	61	0	0	61	0	0	61	0	0	10'
M-61		—		1	65	65	65	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ST-25		—	School Rec/ A.C. B (67)	3	55	55	55	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-62	Area D: Eastbound side of SR-91 from Lakeview Ave to Imp. Hwy		Residential / Activity Category B (67)	2	63	63	63	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-63				1	68	68	69	1	1	A/E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-64				1	62	62	62	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-45		—		5	65	65	66	1	1	A/E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ST-20		—		5	66	66	67	1	1	A/E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ST-19		—		7	60	60	60	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-44		—		4	64	64	64	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-43		—		3	60	60	60	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ST-21		—		7	65	65	66	1	1	A/E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-37		—		4	61	61	62	1	1	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ST-18		—	School Rec/ A.C. B (67)	11	67	67	67	0	0	A/E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-33		—	Rec/ A.C. B (67)	9	67	67	68	1	1	A/E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
LT-7		—	Residential / Activity Category B (67)	4	67	67	68	1	1	A/E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-32		—		6	70	70	71	1	1	A/E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-31		—		13	66	66	66	0	0	A/E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table B-1. Continued

Receiver I.D.	Area	Barrier I.D.	Land Use / Activity Category (NAC)	Number of Dwelling Units	Existing Noise Level $L_{eq}(h)$, dBA	SR-91 Future Worst Hour Noise Levels - $L_{eq}(h)$, dBA																					Break-Line-of-Sight Height [a]
						Design Year Noise Level without Project $L_{eq}(h)$, dBA	Design Year Noise Level with Project, $L_{eq}(h)$, dBA	Design Year Noise Level with Project Minus Design Year Noise Level without Project Conditions $L_{eq}(h)$, dBA	Design Year Noise Level with Project Minus Existing Conditions $L_{eq}(h)$, dBA	Impact Type	Noise Prediction with Barrier at Edge-of-Shoulder, Barrier Insertion Loss (I.L.), and Number of Benefited Receivers (NBR)															
											6 feet			8 feet			10 feet			12 feet			14 feet			16 feet			
											$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	
M-30		—		7	68	68	69	1	1	A/E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-29		—		6	64	64	65	1	1	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-28		—		7	63	63	64	1	1	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-27		—		5	67	67	68	1	1	A/E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ST-17		—		14	63	63	64	1	1	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ST-16		—		6	60	60	60	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-59		—		1	62	62	62	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-60		—		1	62	62	63	1	1	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-26		—		12	60	60	61	1	1	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
LT-4	Area E: WB side of SR-91 Imp. Hwy - Weir Cyn Rd.	—	Resi / Activity Category B(67)	50	61	61	63	2	2	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-16		—		4	55	55	58	3	3	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ST-5		—	Rec/ A.C. B (67)	11	60	60	61	1	1	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ST-7	Area F: Eastbound side of SR-91 from Imp. Hwy to Weir Cyn Rd.	NB-4	Hotel /A.C. E (52 Interior)	45	73	73	74	1	1	None [b]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ST-8		NB-4	Comm'l / A.C. C (72)	1	68	68	70	2	2	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-24		NB-4	Residential / Activity Category B (67)	4	61	61	62	1	1	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ST-9		NB-4		12	60	60	61	1	1	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-25		NB-4		5	58	58	59	1	1	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ST-10		NB-4		6	64	64	65	1	1	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-23		NB-4		4	60	60	61	1	1	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
LT-5		NB-4		6	65	65	66	1	1	A/E	65	1	0	64	2	0	63	3	0	62	4	0	61	5	6	61	5	6	12'
M-22		NB-4		26	61	61	63	2	2	None	63	0	0	63	0	0	63	0	0	62	1	0	62	1	0	62	1	0	12'
M-21		NB-4		10	67	67	68	1	1	A/E	66	2	0	66	2	0	65	3	0	65	3	0	64	4	0	63	5	10	12'
ST-12		NB-4		10	68	68	70	2	2	A/E	67	3	0	67	3	0	66	4	0	66	4	0	65	5	10	64	6	10	12'
M-20		NB-4		9	73	73	74	1	1	A/E	72	2	0	72	2	0	71	3	0	71	3	0	69	5	9	67	7	9	12'
M-19		NB-4		10	68	68	70	2	2	A/E	68	2	0	68	2	0	66	4	0	66	4	0	64	6	10	63	7	10	12'
M-18		NB-4		12	70	70	72	2	2	A/E	69	3	0	69	3	0	68	4	0	68	4	0	65	7	12	64	8	12	12'
ST-11		NB-4		9	67	67	68	1	1	A/E	67	1	0	67	1	0	66	2	0	66	2	0	65	3	0	62	6	9	12'

Table B-1. Continued

Receiver I.D.	Area	Barrier I.D.	Land Use / Activity Category (NAC)	Number of Dwelling Units	Existing Noise Level $L_{eq}(h)$, dBA	SR-91 Future Worst Hour Noise Levels - $L_{eq}(h)$, dBA																					Break-Line-of-Sight Height [a]
						Design Year Noise Level without Project $L_{eq}(h)$, dBA	Design Year Noise Level with Project, $L_{eq}(h)$, dBA	Design Year Noise Level with Project Minus Design Year Noise Level without Project Conditions $L_{eq}(h)$, dBA	Design Year Noise Level with Project Minus Existing Conditions $L_{eq}(h)$, dBA	Impact Type	Noise Prediction with Barrier at Edge-of-Shoulder, Barrier Insertion Loss (I.L.), and Number of Benefited Receivers (NBR)															
											6 feet			8 feet			10 feet			12 feet			14 feet			16 feet			
											$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	
M-17		NB-4		5	68	68	70	2	2	A/E	68	2	0	68	2	0	67	3	0	67	3	0	66	4	0	63	7	5	12'
M-15		NB-4		9	70	70	72	2	2	A/E	71	1	0	71	1	0	70	2	0	70	2	0	69	3	0	66	6	9	12'
ST-14		NB-4		10	69	69	72	3	3	A/E	69	3	0	69	3	0	68	4	0	68	4	0	67	5	10	65	7	10	12'
ST-15		NB-4		22	58	58	59	1	1	None	58	1	0	58	1	0	57	2	0	57	2	0	55	4	0	57	2	0	12'
M-14		NB-4		9	68	68	70	2	2	A/E	68	2	0	68	2	0	67	3	0	67	3	0	66	4	0	63	7	9	12'
M-13		NB-4		7	65	65	67	2	2	A/E	66	1	0	66	1	0	65	2	0	65	2	0	63	4	0	61	6	7	12'
LT-3		NB-4		12	66	66	67	1	1	A/E	65	2	0	65	2	0	64	3	0	64	3	0	62	5	12	60	7	12	12'
ST-6		NB-4		8	65	65	68	3	3	A/E	66	2	0	66	2	0	65	3	0	65	3	0	64	4	0	61	7	8	12'
M-12		NB-4		3	67	67	71	4	4	A/E	68	3	0	67	4	0	67	4	0	65	6	3	62	9	3	61	10	3	12'
ST-3	Area G: Westbound side of SR-91 from Weir Cyn Rd to SR-241	NB-9	Hotel /A.C. E (52 Interior)	40	69	69	69	0	0	None [c]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
LT-2		NB-9	Rec. / A.C. B (67)	9	70	70	70	0	0	A/E	69	1	0	68	2	0	67	3	0	67	3	0	66	4	0	66	4	0	14'
M-2		NB-9		2	66	66	66	0	0	A/E	66	0	0	66	0	0	66	0	0	66	0	0	65	1	0	65	1	0	16'
ST-1		NB-9		1	68	68	68	0	0	A/E	68	0	0	68	0	0	68	0	0	68	0	0	67	1	0	67	1	0	16'
M-1		NB-9		3	69	69	69	0	0	A/E	69	0	0	69	0	0	69	0	0	69	0	0	69	0	0	69	0	0	16'
M-11	Area H: Eastbound side of SR-91 from Weir Cyn Rd to SR-241	NB-10	Residential / Activity Category B (67)	3	62	62	62	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-10		NB-10		3	61	61	61	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-9		NB-10		11	59	59	59	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-8		NB-10		3	65	65	65	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ST-4		NB-10		4	64	64	64	0	0	None	63	1	0	63	1	0	63	1	0	62	2	0	60	4	0	60	4	0	16'
M-58		NB-10		4	74	74	74	0	0	A/E	72	2	0	71	3	0	70	4	0	68	6	4	67	7	4	66	8	4	16'
M-7		NB-10		20	74	74	74	0	0	A/E	72	2	0	71	3	0	70	4	0	69	5	20	67	7	20	66	8	20	16'
M-6		NB-10		24	68	68	68	0	0	A/E	66	2	0	66	2	0	65	3	0	64	4	0	62	6	24	61	7	24	16'
M-5		NB-10		8	75	75	75	0	0	A/E	74	1	0	73	2	0	72	3	0	72	3	0	71	4	0	69	6	8	16'
M-4		NB-10		8	62	62	62	0	0	None	61	1	0	61	1	0	60	2	0	60	2	0	59	3	0	58	4	0	16'
LT-1		NB-10		12	75	75	75	0	0	A/E	75	0	0	74	1	0	74	1	0	73	2	0	72	3	0	71	4	0	16'
M-3		NB-10		8	63	63	63	0	0	None	63	0	0	63	0	0	62	1	0	62	1	0	62	1	0	62	1	0	16'
M-57		NB-10		12	73	73	73	0	0	A/E	73	0	0	73	0	0	72	1	0	72	1	0	71	2	0	71	2	0	16'
ST-2		NB-11		1	74	74	74	0	0	A/E	69	5	1	68	6	1	68	6	1	66	8	1	65	9	1	65	9	1	12'

Table B-1. Continued

Receiver I.D.	Area	Barrier I.D.	Land Use / Activity Category (NAC)	Number of Dwelling Units	Existing Noise Level $L_{eq}(h)$, dBA	SR-91 Future Worst Hour Noise Levels - $L_{eq}(h)$, dBA																					Break-Line-of-Sight Height [a]
						Design Year Noise Level without Project $L_{eq}(h)$, dBA	Design Year Noise Level with Project, $L_{eq}(h)$, dBA	Design Year Noise Level with Project Minus Design Year Noise Level without Project Conditions $L_{eq}(h)$, dBA	Design Year Noise Level with Project Minus Existing Conditions $L_{eq}(h)$, dBA	Impact Type	Noise Prediction with Barrier at Edge-of-Shoulder, Barrier Insertion Loss (I.L.), and Number of Benefited Receivers (NBR)															
											6 feet			8 feet			10 feet			12 feet			14 feet			16 feet			
											$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	

Note: A/E= Future noise conditions approach or exceed the Noise Abatement Criteria.

a Minimum height needed to break the line of sight between 11.5 foot truck stack and first row receivers.

b Based upon the results of the noise measurements conducted for ST-7 as shown in Table 6-1 (window closed versus window wide open and microphone placed at the open window), the noise reduction provided by the building is a minimum of 25 dBA; thus, the interior noise level from the traffic would not approach or exceed the NAC for Activity Category E.

c Based upon the results of the noise measurements conducted for ST-3 as shown in Table 6-1 (window closed versus window wide open and microphone placed at the open window), the noise reduction provided by the building is a minimum of 27 dBA; thus, the interior noise level from the traffic would not approach or exceed the NAC for Activity Category E.

— Barrier height performance not calculated for this location and wall height because either there is no noise impact in this area, or a viable existing noise barrier of an equivalent or greater height has already been constructed here. In the case of the latter situation, an extension of the existing barrier was investigated, up to a height of 16 feet.

d Design year noise level with project noise levels show a small decrease in several areas, due to improvement of barrier performance from changes in model geometry (i.e., travel lanes moving closer to barrier, etc.)

Provides 5 decibels or more noise reduction and breaks the line-of-sight between receiver and 11.5 foot high truck stack.

Table B-2: Traffic Noise Levels for Existing, Future without Project, Future with Project and Future with Considered Noise Barrier at Right-of-Way

Receiver I.D.	Area	Barrier I.D.	Land Use / Activity Category (NAC)	Number of Dwelling Units	Existing Noise Level $L_{eq}(h)$, dBA	SR-91 Future Worst Hour Noise Levels - $L_{eq}(h)$, dBA																					Break-Line-of-Sight Height [a]
						Design Year Noise Level without Project $L_{eq}(h)$, dBA	Design Year Noise Level with Project, $L_{eq}(h)$, dBA	Design Year Noise Level with Project Minus Design Year Noise Level without Project Conditions $L_{eq}(h)$, dBA	Design Year Noise Level with Project Minus Existing Conditions $L_{eq}(h)$, dBA	Impact Type	Noise Prediction with Barrier at Right-of-Way, Barrier Insertion Loss (I.L.), and Number of Benefited Receivers (NBR)															
											6 feet			8 feet			10 feet			12 feet			14 feet			16 feet			
											$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	
ST-26	Area A: Westbound side of SR-91 west of Lakeview Avenue	—	Residential / Activity Category B (67)	11	58	58	58	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-54		—		6	59	59	59	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-56		—		12	65	65	65	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-55		—		7	67	67	66	-1[d]	-1[d]	A/E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-53		—		5	66	66	66	0	0	A/E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-52		—		3	64	64	64	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-50		—		3	64	64	64	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
LT-8		—		4	62	62	62	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-51		—		4	58	58	58	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-48		—		3	64	64	64	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-47		—		4	60	60	60	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
LT-9		—		3	62	62	63	1	1	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-46		—		2	66	66	66	0	0	A/E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-67		—		1	63	63	63	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-68		—		1	60	60	61	1	1	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-69		—		1	59	59	60	1	1	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-70		—		1	60	60	61	1	1	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-71		—		1	59	59	60	1	1	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-72		—		1	59	59	59	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ST-27		—		3	63	63	63	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-65		—		2	64	64	65	1	1	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-66		—		2	62	62	63	1	1	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ST-29	Area B: Eastbound side of SR-91 west of Lakeview Avenue	—	Residential / Activity Category B (67)	6	62	62	61	-1[d]	-1[d]	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ST-28		—		8	61	61	61	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-49		—		3	62	62	62	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-42	Area C: Westbound side of SR-91 east of Lakeview Avenue	—	Residential / Activity Category B (67)	20	57	57	57	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-41		—		5	61	61	61	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ST-22		—		5	60	60	60	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
LT-6		—		6	66	66	66	0	0	A/E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table B-2. Continued

Receiver I.D.	Area	Barrier I.D.	Land Use / Activity Category (NAC)	Number of Dwelling Units	Existing Noise Level $L_{eq}(h)$, dBA	SR-91 Future Worst Hour Noise Levels - $L_{eq}(h)$, dBA																					Break-Line-of-Sight Height [a]
						Design Year Noise Level without Project $L_{eq}(h)$, dBA	Design Year Noise Level with Project, $L_{eq}(h)$, dBA	Design Year Noise Level with Project Minus Design Year Noise Level without Project Conditions $L_{eq}(h)$, dBA	Design Year Noise Level with Project Minus Existing Conditions $L_{eq}(h)$, dBA	Impact Type	Noise Prediction with Barrier at Right-of-Way, Barrier Insertion Loss (I.L.), and Number of Benefited Receivers (NBR)															
											6 feet			8 feet			10 feet			12 feet			14 feet			16 feet			
											$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	
ST-24		—		6	58	58	58	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-35		—		12	58	58	58	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-40		—		4	58	58	59	1	1	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-39		—		3	59	59	59	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-38		—		4	60	60	60	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ST-23		—		3	59	59	59	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-36		—		3	59	59	59	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-34		—		4	61	61	61	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-61				1	65	65	65	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ST-25		—	School Rec/ A.C. B (67)	3	55	55	55	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-62	Area D: Eastbound side of SR-91 from Lakeview Ave to Imp. Hwy	NB-3 EXT W	Residential / Activity Category B (67)	2	63	63	63	0	0	None	63	0	0	63	0	0	63	0	0	63	0	0	63	0	0	63	0	0	8'
M-63		NB-3 EXT W		1	68	68	69	1	1	A/E	67	2	0	65	4	0	64	5	1	64	5	1	64	5	1	63	6	1	8'
M-64		NB-3 EXT W		1	62	62	62	0	0	None	62	0	0	62	0	0	62	0	0	62	0	0	62	0	0	62	0	0	8'
M-45		NB-3		5	65	65	66	1	1	A/E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	65	1	0	12'
ST-20		NB-3		5	66	66	67	1	1	A/E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	65	2	0	12'
ST-19		NB-3		7	60	60	60	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	58	2	0	12'
M-44		NB-3		4	64	64	64	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	63	1	0	12'
M-43		NB-3		3	60	60	60	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	59	1	0	12'
ST-21		NB-3		7	65	65	66	1	1	A/E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	65	1	0	12'
M-37		NB-3		4	61	61	62	1	1	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	60	2	0	12'
ST-18		NB-3	School Rec/ A.C. B (67)	11	67	67	67	0	0	A/E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	66	1	0	12'
M-33		NB-3	Rec/ A.C. B (67)	9	67	67	68	1	1	A/E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	67	1	0	12'
LT-7		NB-3	Residential / Activity Category B (67)	4	67	67	68	1	1	A/E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	67	1	0	12'
M-32		NB-3		6	70	70	71	1	1	A/E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	69	2	0	12'
M-31		NB-3		13	66	66	66	0	0	A/E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	66	0	0	12'

Table B-2. Continued

Receiver I.D.	Area	Barrier I.D.	Land Use / Activity Category (NAC)	Number of Dwelling Units	Existing Noise Level $L_{eq}(h)$, dBA	SR-91 Future Worst Hour Noise Levels - $L_{eq}(h)$, dBA																					Break-Line-of-Sight Height [a]
						Design Year Noise Level without Project $L_{eq}(h)$, dBA	Design Year Noise Level with Project, $L_{eq}(h)$, dBA	Design Year Noise Level with Project Minus Design Year Noise Level without Project Conditions $L_{eq}(h)$, dBA	Design Year Noise Level with Project Minus Existing Conditions $L_{eq}(h)$, dBA	Impact Type	Noise Prediction with Barrier at Right-of-Way, Barrier Insertion Loss (I.L.), and Number of Benefited Receivers (NBR)															
											6 feet			8 feet			10 feet			12 feet			14 feet			16 feet			
											$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	
M-30		NB-3		7	68	68	69	1	1	A/E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	68	1	0	12'
M-29		NB-3		6	64	64	65	1	1	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	64	1	0	12'
M-28		NB-3		7	63	63	64	1	1	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	63	1	0	12'
M-27		NB-3		5	67	67	68	1	1	A/E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	66	2	0	12'
ST-17		NB-3		14	63	63	64	1	1	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	62	2	0	12'
ST-16		NB-3		6	60	60	60	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	59	1	0	12'
M-26		NB-3		12	60	60	61	1	1	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	60	1	0	12'
M-59		—		1	62	62	62	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-60		—		1	62	62	63	1	1	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
LT-4	Area E: WB side of SR-91 from Imp. Hwy to Weir Cyn Rd.		Resi / Activity Category B (67)	50	61	61	63	2	2	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-16				4	55	55	58	3	3	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ST-5			Rec/ A.C. B (67)	11	60	60	61	1	1	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ST-7	Area F: Eastbound side of SR-91 from Imp. Hwy to Weir Cyn Rd.	NB-5	Hotel /A.C. E (52 Interior)	45	73	73	74	1	1	None [b]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ST-8		NB-5	Comm'l / A.C. C (72)	1	68	68	70	2	2	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-24		NB-5	Residential / Activity Category B (67)	4	61	61	62	1	1	None	62	0	0	62	0	0	62	0	0	62	0	0	62	0	0	62	0	0	>16'
ST-9		NB-5		12	60	60	61	1	1	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-25		NB-5		5	58	58	59	1	1	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ST-10		NB-5		6	64	64	65	1	1	None	65	0	0	64	1	0	64	1	0	64	1	0	63	2	0	63	2	0	>16'
M-23		NB-5		4	60	60	61	1	1	None	61	0	0	61	0	0	60	1	0	60	1	0	59	2	0	58	3	0	>16'
LT-5		NB-5		6	65	65	66	1	1	A/E	66	0	0	66	0	0	65	1	0	65	1	0	64	2	0	63	3	0	12'
M-22		NB-5		26	61	61	63	2	2	None	61	2	0	61	2	0	61	2	0	61	2	0	61	2	0	60	3	0	12'
M-21		NB-5		10	67	67	68	1	1	A/E	68	0	0	68	0	0	68	0	0	68	0	0	66	2	0	64	4	0	12'
ST-12		NB-5		10	68	68	70	2	2	A/E	70	0	0	70	0	0	70	0	0	69	1	0	67	3	0	66	4	0	12'
M-20		NB-5		9	73	73	74	1	1	A/E	74	0	0	74	0	0	72	2	0	70	4	0	69	5	9	67	7	9	14'
M-19		NB-5		10	68	68	70	2	2	A/E	70	0	0	70	0	0	70	0	0	70	0	0	70	0	0	70	0	0	12'
M-18		NB-5		12	70	70	72	2	2	A/E	72	0	0	72	0	0	72	0	0	72	0	0	72	0	0	72	0	0	14'
ST-11		NB-5		9	67	67	68	1	1	A/E	68	0	0	68	0	0	68	0	0	68	0	0	68	0	0	67	1	0	12'

Table B-2. Continued

Receiver I.D.	Area	Barrier I.D.	Land Use / Activity Category (NAC)	Number of Dwelling Units	Existing Noise Level $L_{eq}(h)$, dBA	SR-91 Future Worst Hour Noise Levels - $L_{eq}(h)$, dBA																					Break-Line-of-Sight Height [a]
						Design Year Noise Level without Project $L_{eq}(h)$, dBA	Design Year Noise Level with Project, $L_{eq}(h)$, dBA	Design Year Noise Level with Project Minus Design Year Noise Level without Project Conditions $L_{eq}(h)$, dBA	Design Year Noise Level with Project Minus Existing Conditions $L_{eq}(h)$, dBA	Impact Type	Noise Prediction with Barrier at Right-of-Way, Barrier Insertion Loss (I.L.), and Number of Benefited Receivers (NBR)															
											6 feet			8 feet			10 feet			12 feet			14 feet			16 feet			
											$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	
M-17		NB-5		5	68	68	70	2	2	A/E	70	0	0	70	0	0	70	0	0	70	0	0	69	1	0	64	6	5	12'
M-15		NB-5		9	70	70	72	2	2	A/E	72	0	0	72	0	0	72	0	0	72	0	0	71	1	0	71	1	0	12'
ST-14		NB-5		10	69	69	72	3	3	A/E	71	1	0	71	1	0	70	2	0	70	2	0	69	3	0	67	5	10	12'
ST-15		NB-5		22	58	58	59	1	1	None	59	0	0	59	0	0	59	0	0	59	0	0	58	1	0	57	2	0	10'
M-14		NB-5		9	68	68	70	2	2	A/E	70	0	0	70	0	0	70	0	0	70	0	0	69	1	0	67	3	0	10'
M-13		NB-5		7	65	65	67	2	2	A/E	67	0	0	67	0	0	67	0	0	67	0	0	66	1	0	64	3	0	10'
LT-3		NB-5		12	66	66	67	1	1	A/E	67	0	0	67	0	0	66	1	0	66	1	0	64	3	0	61	6	12	10'
ST-6		NB-5		8	65	65	68	3	3	A/E	68	0	0	67	1	0	63	5	8	63	5	8	62	6	8	63	5	8	10'
M-12		NB-5		3	67	67	71	4	4	A/E	71	0	0	68	3	0	69	2	0	68	3	0	67	4	0	66	5	3	10'
ST-3	Area G: Westbound side of SR-91 from Weir Cyn Rd to SR-241		Hotel /A.C. E (52 Interior)	40	69	69	69	0	0	None [c]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
LT-2			Rec. / A.C. B (67)	9	70	70	70	0	0	A/E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
M-2				2	66	66	66	0	0	A/E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
ST-1				1	68	68	68	0	0	A/E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
M-1				3	69	69	69	0	0	A/E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
M-11	Area H: Eastbound side of SR-91 from Weir Cyn Rd to SR-241	NB-12	Residential / Activity Category B (67)	3	62	62	62	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
M-10		NB-12		3	61	61	61	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
M-9		NB-12		11	59	59	59	0	0	None	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
M-8		NB-12		3	65	65	65	0	0	None	64	1	0	64	1	0	63	2	0	63	2	0	62	3	0	62	3	0	>16'
ST-4		NB-12		4	64	64	64	0	0	None	63	1	0	62	2	0	62	2	0	61	3	0	61	3	0	60	4	0	>16'
M-7		NB-12		20	74	74	74	0	0	A/E	74	0	0	74	0	0	74	0	0	73	1	0	72	2	0	71	3	0	>16'
M-6		NB-12		24	68	68	68	0	0	A/E	68	0	0	68	0	0	67	1	0	66	2	0	66	2	0	65	3	0	>16'
M-5		NB-12		8	75	75	75	0	0	A/E	75	0	0	75	0	0	74	1	0	74	1	0	73	2	0	72	3	0	>16'
M-4		NB-12		8	62	62	62	0	0	None	62	0	0	62	0	0	61	1	0	61	1	0	61	1	0	60	2	0	>16'
LT-1		NB-12		12	75	75	75	0	0	A/E	75	0	0	75	0	0	75	0	0	74	1	0	73	2	0	73	2	0	>16'
M-3		NB-12		8	63	63	63	0	0	None	63	0	0	63	0	0	63	0	0	63	0	0	62	1	0	62	1	0	>16'
ST-2		NB-13		1	74	74	74	0	0	A/E	69	5	1	69	5	1	67	7	1	67	7	1	66	8	1	65	9	1	12'

Table B-2. Continued

Receiver I.D.	Area	Barrier I.D.	Land Use / Activity Category (NAC)	Number of Dwelling Units	Existing Noise Level $L_{eq}(h)$, dBA	SR-91 Future Worst Hour Noise Levels - $L_{eq}(h)$, dBA																					Break-Line-of-Sight Height [a]
						Design Year Noise Level without Project $L_{eq}(h)$, dBA	Design Year Noise Level with Project, $L_{eq}(h)$, dBA	Design Year Noise Level with Project Minus Design Year Noise Level without Project Conditions $L_{eq}(h)$, dBA	Design Year Noise Level with Project Minus Existing Conditions $L_{eq}(h)$, dBA	Impact Type	Noise Prediction with Barrier at Right-of-Way, Barrier Insertion Loss (I.L.), and Number of Benefited Receivers (NBR)																	
											6 feet			8 feet			10 feet			12 feet			14 feet			16 feet		
											$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	

Note: A/E= Future noise conditions approach or exceed the Noise Abatement Criteria.

[a] Minimum height needed to break the line of sight between 11.5 foot truck stack and first row receivers.

[b] Based upon the results of the noise measurements conducted for ST-7 as shown in Table 6-1 (window closed versus window wide open and microphone placed at the open window), the noise reduction provided by the building is a minimum of 25 dBA; thus, the interior noise level from the traffic would not approach or exceed the NAC for Activity Category E.

[c] Based upon the results of the noise measurements conducted for ST-3 as shown in Table 6-1 (window closed versus window wide open and microphone placed at the open window), the noise reduction provided by the building is a minimum of 27 dBA; thus, the interior noise level from the traffic would not approach or exceed the NAC for Activity Category E.

— Barrier height performance not calculated for this location and wall height because either there is no noise impact in this area, or a viable existing noise barrier of an equivalent or greater height has already been constructed here. In the case of the latter situation, an extension of the existing barrier was investigated, up to a height of 16 feet.

d Design year noise level with project noise levels show a small decrease in several areas, due to improvement of barrier performance from changes in model geometry (i.e., travel lanes moving closer to barrier, etc.)

Provides 5 decibels or more noise reduction and breaks the line-of-sight between receiver and 11.5 foot high truck stack.

Table B-3: Traffic Noise Levels for Existing, Future without Project, Future with Project and Future with Considered Noise Barrier at Residential Property Line

Receiver I.D.	Area	Barrier I.D.	Land Use / Activity Category (NAC)	Number of Dwelling Units	Existing Noise Level $L_{eq}(h)$, dBA	SR-91 Future Worst Hour Noise Levels - Leq(h), dBA																					Break-Line-of-Sight Height [a]
						Design Year Noise Level without Project $L_{eq}(h)$, dBA	Design Year Noise Level with Project $L_{eq}(h)$, dBA	Design Year Noise Level with Project Minus Design Year Noise Level without Project Conditions $L_{eq}(h)$, dBA	Design Year Noise Level with Project Minus Existing Conditions $L_{eq}(h)$, dBA	Impact Type	Noise Prediction with Barrier at Residential Property Line, Barrier Insertion Loss (I.L.), and Number of Benefited Receivers (NBR)															
											6 feet			8 feet			10 feet			12 feet			14 feet			16 feet			
											$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	
LT-5	Area F: Eastbound side of SR-91 from Imp. Hwy to Weir Cyn Rd.	NB-6	Residential / Activity Category B (67)	6	65	65	66	1	1	A/E	66	0	0	64	2	0	62	4	0	62	4	0	62	4	0	61	5	6	6'
M-22		NB-6		26	61	61	63	2	2	None	61	2	0	61	2	0	61	2	0	60	3	0	60	3	0	60	3	0	6'
M-21		NB-6		10	67	67	68	1	1	A/E	68	0	0	66	2	0	65	3	0	64	4	0	64	4	0	63	5	10	6'
ST-12		NB-6		10	68	68	70	2	2	A/E	70	0	0	68	2	0	67	3	0	66	4	0	66	4	0	66	4	0	8'
M-20		NB-6		9	73	73	74	1	1	A/E	74	0	0	71	3	0	69	5	9	68	6	9	68	6	9	67	7	9	8'
M-19		NB-6		10	68	68	70	2	2	A/E	70	0	0	68	2	0	67	3	0	66	4	0	65	5	10	64	6	10	6'
M-18		NB-6		12	70	70	72	2	2	A/E	72	0	0	70	2	0	68	4	0	67	5	12	66	6	12	65	7	12	6'
ST-11		NB-6		9	67	67	68	1	1	A/E	68	0	0	67	1	0	67	1	0	66	2	0	65	3	0	65	3	0	6'
M-17		NB-6		5	68	68	70	2	2	A/E	70	0	0	68	2	0	68	2	0	67	3	0	66	4	0	65	5	5	6'
M-15		NB-6		9	70	70	72	2	2	A/E	71	1	0	70	2	0	69	3	0	68	4	0	67	5	9	67	5	9	6'
ST-14		NB-6		10	69	69	72	3	3	A/E	71	1	0	70	2	0	69	3	0	68	4	0	68	4	0	67	5	10	6'
ST-15		NB-6		22	58	58	59	1	1	None	59	0	0	59	0	0	58	1	0	58	1	0	58	1	0	57	2	0	6'
M-14		NB-6		9	68	68	70	2	2	A/E	69	1	0	69	1	0	68	2	0	67	3	0	67	3	0	66	4	0	6'
M-13		NB-6		7	65	65	67	2	2	A/E	67	0	0	66	1	0	65	2	0	64	3	0	63	4	0	63	4	0	6'
LT-3		NB-6		12	66	66	67	1	1	A/E	67	0	0	66	1	0	65	2	0	65	2	0	64	3	0	63	4	0	6'
ST-6		NB-6		8	65	65	68	3	3	A/E	66	2	0	66	2	0	65	3	0	64	4	0	64	4	0	63	5	8	6'
M-12		NB-6		3	67	67	71	4	4	A/E	68	3	0	67	4	0	66	5	3	65	6	3	64	7	3	64	7	3	6'
M-58	Area H: Eastbound side of SR-91 from Weir Cyn Rd to SR-241	NB-14	Residential / Activity Category B (67)	4	74	74	74	0	0	A/E	68	6	4	67	7	4	66	8	4	65	9	4	64	10	4	64	10	4	6'
M-7		NB-14		20	74	74	74	0	0	A/E	67	7	20	65	9	20	64	10	20	62	12	20	62	12	20	61	13	20	6'
M-6		NB-14		24	68	68	68	0	0	A/E	67	1	0	67	1	0	67	1	0	67	1	0	67	1	0	67	1	0	6'
M-5		NB-14		8	75	75	75	0	0	A/E	68	7	8	65	10	8	63	12	8	61	14	8	60	15	8	59	16	8	6'
M-4		NB-14		8	62	62	62	0	0	None	61	1	0	60	2	0	60	2	0	59	3	0	59	3	0	58	4	0	6'
LT-1		NB-14		12	75	75	75	0	0	A/E	65	10	12	63	12	12	61	14	12	60	15	12	59	16	12	58	17	12	6'
M-3		NB-14		8	63	63	63	0	0	None	62	1	0	62	1	0	62	1	0	61	2	0	61	2	0	61	2	0	6'
M-57		NB-14		12	73	73	73	0	0	A/E	66	7	12	63	10	12	61	12	12	60	13	12	58	15	12	57	16	12	6'
ST-2		NB-15		1	74	74	74	0	0	A/E	73	1	0	71	3	0	71	3	0	70	4	0	69	5	1	69	5	1	12'

Note: A/E= Future noise conditions approach or exceed the Noise Abatement Criteria.

a Minimum height needed to break the line of sight between 11.5 foot truck stack and first row receivers.

Provides 5 decibels or more noise reduction and breaks the line-of-sight between receiver and 11.5 foot high truck stack.

Table B-4: Traffic Noise Levels for Existing, Future without Project, Future with Project and Future with Considered Noise Barrier 6 Feet inside Department Right-of-Way

Receiver I.D.	Area	Barrier I.D.	Land Use / Activity Category (NAC)	Number of Dwelling Units	Existing Noise Level $L_{eq}(h)$, dBA	SR-91 Future Worst Hour Noise Levels - $L_{eq}(h)$, dBA																					Break-Line-of-Sight Height [a]
						Design Year Noise Level without Project $L_{eq}(h)$, dBA	Design Year Noise Level with Project, $L_{eq}(h)$	Design Year Noise Level with Project Minus Design Year Noise Level without Project Conditions $L_{eq}(h)$, dBA	Design Year Noise Level with Project Minus Existing Conditions $L_{eq}(h)$, dBA	Impact Type	Noise Prediction with Barrier 6' Inside Right-of-Way, Barrier Insertion Loss (I.L.), and Number of Benefited Receivers (NBR)															
											6 feet			8 feet			10 feet			12 feet			14 feet			16 feet			
											$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	
LT-5	Area F: Eastbound side of SR-91 from Imp. Hwy to Weir Cyn Rd.	NB-7	Residential / Activity Category B (67)	6	65	65	66	1	1	A/E	66	0	0	66	0	0	65	1	0	65	1	0	64	2	0	63	3	0	14'
M-22		NB-7		26	61	61	63	2	2	None	61	2	0	61	2	0	61	2	0	61	2	0	61	2	0	60	3	0	14'
M-21		NB-7		10	67	67	68	1	1	A/E	68	0	0	68	0	0	68	0	0	68	0	0	66	2	0	64	4	0	14'
ST-12		NB-7		10	68	68	70	2	2	A/E	70	0	0	70	0	0	70	0	0	69	1	0	67	3	0	66	4	0	14'
M-20		NB-7		9	73	73	74	1	1	A/E	74	0	0	74	0	0	72	2	0	70	4	0	69	5	9	67	7	9	16'
M-19		NB-7		10	68	68	70	2	2	A/E	70	0	0	70	0	0	70	0	0	70	0	0	70	0	0	70	0	0	>16'
M-18		NB-7		12	70	70	72	2	2	A/E	72	0	0	72	0	0	72	0	0	72	0	0	72	0	0	72	0	0	>16'
ST-11		NB-7		9	67	67	68	1	1	A/E	68	0	0	68	0	0	68	0	0	68	0	0	68	0	0	67	1	0	>16'
M-17		NB-7		5	68	68	70	2	2	A/E	70	0	0	70	0	0	70	0	0	70	0	0	69	1	0	67	3	0	>16'
M-15		NB-7		9	70	70	72	2	2	A/E	72	0	0	72	0	0	72	0	0	72	0	0	71	1	0	71	1	0	>16'
ST-14		NB-7		10	69	69	72	3	3	A/E	71	1	0	71	1	0	70	2	0	70	2	0	69	3	0	67	5	10	16'
ST-15		NB-7		22	58	58	59	1	1	None	59	0	0	59	0	0	59	0	0	59	0	0	58	1	0	57	2	0	16'
M-14		NB-7		9	68	68	70	2	2	A/E	70	0	0	70	0	0	70	0	0	70	0	0	69	1	0	67	3	0	14'
M-13		NB-7		7	65	65	67	2	2	A/E	67	0	0	67	0	0	67	0	0	67	0	0	66	1	0	64	3	0	14'
LT-3		NB-7		12	66	66	67	1	1	A/E	67	0	0	67	0	0	66	1	0	66	1	0	64	3	0	61	6	12	12'
ST-6		NB-7		8	65	65	68	3	3	A/E	68	0	0	67	1	0	63	5	8	63	5	8	62	6	8	63	5	8	12
M-12		NB-7		3	67	67	71	4	4	A/E	71	0	0	69	2	0	67	4	0	67	4	0	67	4	0	66	5	3	12'

Note: A/E= Future noise conditions approach or exceed the Noise Abatement Criteria.
Provides 5 decibels or more noise reduction and breaks the line-of-sight between receiver and 11.5 foot high truck stack.

Table B-5: Traffic Noise Levels for Existing, Future without Project, Future with Project and Future with Considered Noise Barrier at Right-of-Way (Base Elevation of Wall Equivalent to Top of Adjacent Berm)

Receiver I.D.	Area	Barrier I.D.	Land Use / Activity Category (NAC)	Number of Dwelling Units	Existing Noise Level $L_{eq}(h)$, dBA	SR-91 Future Worst Hour Noise Levels - $L_{eq}(h)$, dBA																					Break-Line-of-Sight Height [a]
						Design Year Noise Level without Project $L_{eq}(h)$, dBA	Design Year Noise Level with Project $L_{eq}(h)$, dBA	Design Year Noise Level with Project Minus Design Year Noise Level without Project Conditions $L_{eq}(h)$, dBA	Design Year Noise Level with Project Minus Existing Conditions $L_{eq}(h)$, dBA	Impact Type	Noise Prediction with Barrier at Right-of-Way (Base Elevation of Wall Equiv. to Top of Adjacent Berm), Barrier Insertion Loss (I.L.), and Number of Benefited Receivers (NBR)															
											6 feet			8 feet			10 feet			12 feet			14 feet			16 feet			
											$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	
LT-5	Area F: Eastbound side of SR-91 from Imp. Hwy to Weir Cyn Rd.	NB-8	Residential / Activity Category B (67)	6	65	65	66	1	1	A/E	64	2	0	63	3	0	62	4	0	62	4	0	61	5	6	60	6	6	10'
M-22		NB-8		26	61	61	63	2	2	None	60	3	0	60	3	0	60	3	0	60	3	0	59	4	0	62	1	0	10'
M-21		NB-8		10	67	67	68	1	1	A/E	66	2	0	64	4	0	63	5	10	64	4	0	64	4	0	60	8	10	10'
ST-12		NB-8		10	68	68	70	2	2	A/E	67	3	0	68	2	0	67	3	0	66	4	0	65	5	10	58	12	10	10'
M-20		NB-8		9	73	73	74	1	1	A/E	73	1	0	71	3	0	69	5	9	68	6	9	67	7	9	62	12	9	10'
M-19		NB-8		10	68	68	70	2	2	A/E	67	3	0	64	6	10	63	7	10	65	5	10	65	5	10	69	1	0	6'
M-18		NB-8		12	70	70	72	2	2	A/E	66	6	12	65	7	12	68	4	0	67	5	12	66	6	12	64	8	12	6'
ST-11		NB-8		9	67	67	68	1	1	A/E	63	5	9	62	6	9	62	6	9	65	3	0	64	4	0	68	0	0	6'
M-17		NB-8		5	68	68	70	2	2	A/E	64	6	5	63	7	5	66	4	0	66	4	0	65	5	5	66	4	0	6'
M-15		NB-8		9	70	70	72	2	2	A/E	66	6	9	65	7	9	65	7	9	67	5	9	67	5	9	66	6	9	6'
ST-14		NB-8		10	69	69	72	3	3	A/E	65	7	10	65	7	10	67	5	10	67	5	10	66	6	10	66	6	10	6'
ST-15		NB-8		22	58	58	59	1	1	None	57	2	0	58	1	0	58	1	0	57	2	0	57	2	0	57	2	0	6'
M-14		NB-8		9	68	68	70	2	2	A/E	65	5	9	63	7	9	63	7	9	62	8	9	63	7	9	65	5	9	6'
M-13		NB-8		7	65	65	67	2	2	A/E	64	3	0	61	6	7	60	7	7	59	8	7	60	7	7	62	5	7	6'
LT-3		NB-8		12	66	66	67	1	1	A/E	62	5	12	61	6	12	64	3	0	64	3	0	63	4	0	62	5	12	6'
ST-6		NB-8		8	65	65	68	3	3	A/E	64	4	0	62	6	8	66	2	0	65	3	0	64	4	0	63	5	8	6'
M-12		NB-8		3	67	67	71	4	4	A/E	67	4	0	69	2	0	68	3	0	67	4	0	66	5	3	65	6	3	6'

Note: A/E= Future noise conditions approach or exceed the Noise Abatement Criteria.

[a] Minimum height needed to break the line of sight between 11.5 foot truck stack and first row receivers.

[b] As a result of the complex geometry in portions of the project (particularly Area F) resulting from multiple barriers, the modeled barrier insertion loss is shown to decrease in some cases as barrier height increases. This is due to the loss (within the TNM algorithms) of a "double-barrier effect" as the considered soundwall height increases.

Provides 5 decibels or more noise reduction and breaks the line-of-sight between receiver and 11.5 foot high truck stack.

Appendix C Noise Barrier Reasonableness Analysis Worksheet

The following worksheets C-1A through C-11B were utilized to calculate the reasonableness allowances for each of the feasible noise barrier options (summarized in Chapter 7).

Worksheet C-1A

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-1EXT, Area A, 14 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	66 dBA*	Check	
69 dBA or less	Add $2,000	✓	$2,000
70–74 dBA	Add $4,000		
75–78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	0 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3–7 dBA	Add $2,000		
8–11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	5 dBA *		
Less than 6 dBA	Add $ 0	✓	$0
6–8 dBA	Add $2,000		
9–11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$48,000
Number of Benefited Residences			2
Total Unmodified Reasonableness Allowance			$88,000
* at Critical Design Receiver M-46			

Worksheet C-1B

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-1EXT, Area A, 16 feet high		
Base Allowance (2008 Dollars)			$ 32,000
1) Absolute Noise Levels	66 dBA*	Check	
69 dBA or less	Add $2,000	✓	$2,000
70-74 dBA	Add $4,000		
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	0 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3-7 dBA	Add $2,000		
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	6 dBA *		
Less than 6 dBA	Add $ 0		
6-8 dBA	Add $2,000	✓	$2,000
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$46,000
Number of Benefited Residences			2
Total Unmodified Reasonableness Allowance			$92,000
* at Critical Design Receiver M-46			

Worksheet C-2A

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 07/08
NOISE BARRIER I.D. & LOCATION	NB-3 EXT W, Area D, 10 feet high		
Base Allowance (2008 Dollars)			$ 32,000
1) Absolute Noise Levels	69 dBA*	Check	
69 dBA or less	Add $2,000	✓	$2,000
70-74 dBA	Add $4,000		
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	1 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3-7 dBA	Add $2,000		
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	5 dBA *		
Less than 6 dBA	Add $ 0	✓	$0
6-8 dBA	Add $2,000		
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$44,000
Number of Benefited Residences			1
Total Unmodified Reasonableness Allowance			$44,000
* at Critical Design Receiver M-63			

Worksheet C-2B

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 07/08
NOISE BARRIER I.D. & LOCATION	NB-3 EXT W, Area D, 12 feet high		
Base Allowance (2008 Dollars)			$ 32,000
1) Absolute Noise Levels	69 dBA*	Check	
69 dBA or less	Add $2,000	✓	$2,000
70-74 dBA	Add $4,000		
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	1 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3-7 dBA	Add $2,000		
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	5 dBA *		
Less than 6 dBA	Add $ 0	✓	$0
6-8 dBA	Add $2,000		
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$44,000
Number of Benefited Residences			1
Total Unmodified Reasonableness Allowance			$44,000
* at Critical Design Receiver M-63			

Worksheet C-2C

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 07/08
NOISE BARRIER I.D. & LOCATION	NB-3 EXT W, Area D, 14 feet high		
Base Allowance (2008 Dollars)			$ 32,000
1) Absolute Noise Levels	69 dBA*	Check	
69 dBA or less	Add $2,000	✓	$2,000
70-74 dBA	Add $4,000		
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	1 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3-7 dBA	Add $2,000		
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	5 dBA *		
Less than 6 dBA	Add $ 0	✓	$0
6-8 dBA	Add $2,000		
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$44,000
Number of Benefited Residences			1
Total Unmodified Reasonableness Allowance			$44,000
* at Critical Design Receiver M-63			

Worksheet C-2D

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 07/08
NOISE BARRIER I.D. & LOCATION	NB-3 EXT W, Area D, 16 feet high		
Base Allowance (2008 Dollars)			$ 32,000
1) Absolute Noise Levels	69 dBA*	Check	
69 dBA or less	Add $2,000	✓	$2,000
70-74 dBA	Add $4,000		
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	1 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3-7 dBA	Add $2,000		
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	6 dBA *		
Less than 6 dBA	Add $ 0		
6-8 dBA	Add $2,000	✓	$2,000
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$46,000
Number of Benefited Residences			1
Total Unmodified Reasonableness Allowance			$46,000
* at Critical Design Receiver M-63			

Worksheet C-3A

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-4, Area F, 12 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	71 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000	✓	$4,000
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	4 dBA*	Check	
Less than 3 dBA	Add $ 0		
3-7 dBA	Add $2,000	✓	$2,000
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	6 dBA *		
Less than 6 dBA	Add $ 0		
6-8 dBA	Add $2,000	✓	$2,000
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$50,000
Number of Benefited Residences			3
Total Unmodified Reasonableness Allowance			$150,000
* at Critical Design Receiver M-12			

Worksheet C-3B

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-4, Area F, 14 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	71 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000	✓	$4,000
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	4 dBA*	Check	
Less than 3 dBA	Add $ 0		
3-7 dBA	Add $2,000	✓	$2,000
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	9 dBA *		
Less than 6 dBA	Add $ 0		
6-8 dBA	Add $2,000		
9-11 dBA	Add $4,000	✓	$4,000
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$52,000
Number of Benefited Residences			72
Total Unmodified Reasonableness Allowance			$3,744,000
* at Critical Design Receiver M-12			

Worksheet C-3C

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-4, Area F, 16 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	71 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000	✓	$4,000
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	4 dBA*	Check	
Less than 3 dBA	Add $ 0		
3-7 dBA	Add $2,000	✓	$2,000
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	10 dBA *		
Less than 6 dBA	Add $ 0		
6-8 dBA	Add $2,000		
9-11 dBA	Add $4,000	✓	$4,000
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$52,000
Number of Benefited Residences			129
Total Unmodified Reasonableness Allowance			$6,708,000
* at Critical Design Receiver M-12			

Worksheet C-4A

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-5, Area F, 14 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	74 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000	✓	$4,000
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	1 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3-7 dBA	Add $2,000		
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	5 dBA *		
Less than 6 dBA	Add $ 0	✓	$0
6-8 dBA	Add $2,000		
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$46,000
Number of Benefited Residences			17
Total Unmodified Reasonableness Allowance			$782,000
* at Critical Design Receiver M-20			

Worksheet C-4B

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-5, Area F, 16 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	74 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000	✓	$4,000
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	1 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3-7 dBA	Add $2,000		
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	7 dBA *		
Less than 6 dBA	Add $ 0		
6-8 dBA	Add $2,000	✓	$2,000
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$48,000
Number of Benefited Residences			47
Total Unmodified Reasonableness Allowance			$2,256,000
* at Critical Design Receiver M-20			

Worksheet C-5A

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-6, Area F, 10 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	71 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000	✓	$4,000
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	4 dBA*	Check	
Less than 3 dBA	Add $ 0		
3-7 dBA	Add $2,000	✓	$2,000
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	5 dBA *		
Less than 6 dBA	Add $ 0	✓	$0
6-8 dBA	Add $2,000		
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$48,000
Number of Benefited Residences			12
Total Unmodified Reasonableness Allowance			$576,000
* at Critical Design Receiver M-12			

Worksheet C-5B

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-6, Area F, 12 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	71 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000	✓	$4,000
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	4 dBA*	Check	
Less than 3 dBA	Add $ 0		
3-7 dBA	Add $2,000	✓	$2,000
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	6 dBA *		
Less than 6 dBA	Add $ 0		
6-8 dBA	Add $2,000	✓	$2,000
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$50,000
Number of Benefited Residences			24
Total Unmodified Reasonableness Allowance			$1,200,000
* at Critical Design Receiver M-12			

Worksheet C-5C

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-6, Area F, 14 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	71 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000	✓	$4,000
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	4 dBA*	Check	
Less than 3 dBA	Add $ 0		
3-7 dBA	Add $2,000	✓	$2,000
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	7 dBA *		
Less than 6 dBA	Add $ 0		
6-8 dBA	Add $2,000	✓	$2,000
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$50,000
Number of Benefited Residences			43
Total Unmodified Reasonableness Allowance			$2,150,000
* at Critical Design Receiver M-12			

Worksheet C-5D

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-6, Area F, 16 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	71 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000	✓	$4,000
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	4 dBA*	Check	
Less than 3 dBA	Add $ 0		
3-7 dBA	Add $2,000	✓	$2,000
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	7 dBA *		
Less than 6 dBA	Add $ 0		
6-8 dBA	Add $2,000	✓	$2,000
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$50,000
Number of Benefited Residences			82
Total Unmodified Reasonableness Allowance			$4,100,000
* at Critical Design Receiver M-12			

Worksheet C-6A

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-7, Area F, 14 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	74 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000	✓	$4,000
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	1 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3-7 dBA	Add $2,000		
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	5 dBA *		
Less than 6 dBA	Add $ 0	✓	$0
6-8 dBA	Add $2,000		
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$46,000
Number of Benefited Residences			17
Total Unmodified Reasonableness Allowance			$782,000
* at Critical Design Receiver M-20			

Worksheet C-6B

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-7, Area F, 16 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	74 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000	✓	$0
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	1 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3-7 dBA	Add $2,000		
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	7 dBA *		
Less than 6 dBA	Add $ 0		
6-8 dBA	Add $2,000	✓	$2,000
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$48,000
Number of Benefited Residences			42
Total Unmodified Reasonableness Allowance			$2,016,000
* at Critical Design Receiver M-20			

Worksheet C-7A

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-8, Area F, 10 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	74 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000	✓	$4,000
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	1 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3-7 dBA	Add $2,000		
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	5 dBA *		
Less than 6 dBA	Add $ 0	✓	$0
6-8 dBA	Add $2,000		
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$46,000
Number of Benefited Residences			73
Total Unmodified Reasonableness Allowance			$3,358,000
* at Critical Design Receiver M-20			

Worksheet C-7B

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-8, Area F, 12 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	74 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000	✓	$4,000
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	1 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3-7 dBA	Add $2,000		
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	6 dBA *		
Less than 6 dBA	Add $ 0		
6-8 dBA	Add $2,000	✓	$2,000
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$48,000
Number of Benefited Residences			66
Total Unmodified Reasonableness Allowance			$3,168,000
* at Critical Design Receiver M-20			

Worksheet C-7C

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-8, Area F, 14 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	74 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000	✓	$4,000
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	1 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3-7 dBA	Add $2,000		
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	7 dBA *		
Less than 6 dBA	Add $ 0		
6-8 dBA	Add $2,000	✓	$2,000
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$48,000
Number of Benefited Residences			90
Total Unmodified Reasonableness Allowance			$4,320,000
* at Critical Design Receiver M-20			

Worksheet C-7D

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-8, Area F, 16 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	74 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000	✓	$4,000
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	1 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3-7 dBA	Add $2,000		
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	12 dBA *		
Less than 6 dBA	Add $ 0		
6-8 dBA	Add $2,000		
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000	✓	$6,000
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$52,000
Number of Benefited Residences			105
Total Unmodified Reasonableness Allowance			$5,460,000
* at Critical Design Receiver M-20			

Worksheet C-8A

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-10, Area H, 12 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	74 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000	✓	$4,000
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	0 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3-7 dBA	Add $2,000		
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	5 dBA *		
Less than 6 dBA	Add $ 0	✓	$0
6-8 dBA	Add $2,000		
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$46,000
Number of Benefited Residences			24
Total Unmodified Reasonableness Allowance			$1,104,000
* at Critical Design Receiver M-7			

Worksheet C-8B

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-10, Area H, 14 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	74 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000	✓	$4,000
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	0 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3-7 dBA	Add $2,000		
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	7 dBA *		
Less than 6 dBA	Add $ 0		
6-8 dBA	Add $2,000	✓	$2,000
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$48,000
Number of Benefited Residences			48
Total Unmodified Reasonableness Allowance			$2,304,000
* at Critical Design Receiver M-7			

Worksheet C-8C

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-10, Area H, 16 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	74 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000	✓	$4,000
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	0 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3-7 dBA	Add $2,000		
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	8 dBA *		
Less than 6 dBA	Add $ 0		
6-8 dBA	Add $2,000	✓	$2,000
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$48,000
Number of Benefited Residences			56
Total Unmodified Reasonableness Allowance			$2,688,000
* at Critical Design Receiver M-7			

Worksheet C-9A

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-11, Area H, 6 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	74 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000	✓	$4,000
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	0 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3-7 dBA	Add $2,000		
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	5 dBA *		
Less than 6 dBA	Add $ 0	✓	$0
6-8 dBA	Add $2,000		
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$46,000
Number of Benefited Residences			1
Total Unmodified Reasonableness Allowance			$46,000
* at Critical Design Receiver ST-2			

Worksheet C-9B

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-11, Area H, 8 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	74 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000	✓	$4,000
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	0 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3-7 dBA	Add $2,000		
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	6 dBA *		
Less than 6 dBA	Add $ 0		
6-8 dBA	Add $2,000	✓	$2,000
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$48,000
Number of Benefited Residences			1
Total Unmodified Reasonableness Allowance			$48,000
* at Critical Design Receiver ST-2			

Worksheet C-9C

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-11, Area H, 10 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	74 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000	✓	$4,000
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	0 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3-7 dBA	Add $2,000		
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	6 dBA *		
Less than 6 dBA	Add $ 0		
6-8 dBA	Add $2,000	✓	$2,000
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$48,000
Number of Benefited Residences			1
Total Unmodified Reasonableness Allowance			$48,000
* at Critical Design Receiver ST-2			

Worksheet C-9D

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-11, Area H, 12 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	74 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000	✓	$4,000
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	0 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3-7 dBA	Add $2,000		
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	8 dBA *		
Less than 6 dBA	Add $ 0		
6-8 dBA	Add $2,000	✓	$2,000
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$48,000
Number of Benefited Residences			1
Total Unmodified Reasonableness Allowance			$48,000
* at Critical Design Receiver ST-2			

Worksheet C-9E

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-11, Area H, 14 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	74 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000	✓	$4,000
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	0 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3-7 dBA	Add $2,000		
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	9 dBA *		
Less than 6 dBA	Add $ 0		
6-8 dBA	Add $2,000		
9-11 dBA	Add $4,000	✓	$4,000
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$50,000
Number of Benefited Residences			1
Total Unmodified Reasonableness Allowance			$50,000
* at Critical Design Receiver ST-2			

Worksheet C-9F

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-11, Area H, 16 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	74 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000	✓	$4,000
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	0 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3-7 dBA	Add $2,000		
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	9 dBA *		
Less than 6 dBA	Add $ 0		
6-8 dBA	Add $2,000		
9-11 dBA	Add $4,000	✓	$4,000
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$50,000
Number of Benefited Residences			1
Total Unmodified Reasonableness Allowance			$50,000
* at Critical Design Receiver ST-2			

Worksheet C-10A

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-13, Area H, 6 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	74 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000	✓	$4,000
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	0 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3-7 dBA	Add $2,000		
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	5 dBA *		
Less than 6 dBA	Add $ 0	✓	$0
6-8 dBA	Add $2,000		
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$46,000
Number of Benefited Residences			1
Total Unmodified Reasonableness Allowance			$46,000
* at Critical Design Receiver ST-2			

Worksheet C-10B

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-13, Area H, 8 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	74 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000	✓	$4,000
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	0 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3-7 dBA	Add $2,000		
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	5 dBA *		
Less than 6 dBA	Add $ 0	✓	$0
6-8 dBA	Add $2,000		
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$46,000
Number of Benefited Residences			1
Total Unmodified Reasonableness Allowance			$46,000
* at Critical Design Receiver ST-2			

Worksheet C-10C

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-13, Area H, 10 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	74 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000	✓	$4,000
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	0 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3-7 dBA	Add $2,000		
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	7 dBA *		
Less than 6 dBA	Add $ 0		
6-8 dBA	Add $2,000	✓	$2,000
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$48,000
Number of Benefited Residences			1
Total Unmodified Reasonableness Allowance			$48,000
* at Critical Design Receiver ST-2			

Worksheet C-10D

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-13, Area H, 12 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	74 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000	✓	$4,000
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	0 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3-7 dBA	Add $2,000		
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	7 dBA *		
Less than 6 dBA	Add $ 0		
6-8 dBA	Add $2,000	✓	$2,000
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$48,000
Number of Benefited Residences			1
Total Unmodified Reasonableness Allowance			$48,000
* at Critical Design Receiver ST-2			

Worksheet C-10E

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-13, Area H, 14 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	74 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000	✓	$4,000
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	0 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3-7 dBA	Add $2,000		
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	8 dBA *		
Less than 6 dBA	Add $ 0		
6-8 dBA	Add $2,000	✓	$2,000
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$48,000
Number of Benefited Residences			1
Total Unmodified Reasonableness Allowance			$48,000
* at Critical Design Receiver ST-2			

Worksheet C-10F

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-13, Area H, 16 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	74 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000	✓	$4,000
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	0 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3-7 dBA	Add $2,000		
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	9 dBA *		
Less than 6 dBA	Add $ 0		
6-8 dBA	Add $2,000		
9-11 dBA	Add $4,000	✓	$4,000
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$50,000
Number of Benefited Residences			1
Total Unmodified Reasonableness Allowance			$50,000
* at Critical Design Receiver ST-2			

Worksheet C-11A

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-14, Area H, 6 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	75 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000		
75-78 dBA	Add $6,000	✓	$6,000
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	0 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3-7 dBA	Add $2,000		
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	10 dBA *		
Less than 6 dBA	Add $ 0		
6-8 dBA	Add $2,000		
9-11 dBA	Add $4,000	✓	$4,000
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$52,000
Number of Benefited Residences			56
Total Unmodified Reasonableness Allowance			$2,912,000
* at Critical Design Receiver LT-1			

Worksheet C-11B

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-14, Area H, 8 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	75 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000		
75-78 dBA	Add $6,000	✓	$6,000
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	0 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3-7 dBA	Add $2,000		
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	12 dBA *		
Less than 6 dBA	Add $ 0		
6-8 dBA	Add $2,000		
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000	✓	$6,000
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$54,000
Number of Benefited Residences			56
Total Unmodified Reasonableness Allowance			$3,024,000
* at Critical Design Receiver LT-1			

Worksheet C-11C

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-14, Area H, 10 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	75 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000		
75-78 dBA	Add $6,000	✓	$6,000
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	0 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3-7 dBA	Add $2,000		
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	14 dBA *		
Less than 6 dBA	Add $ 0		
6-8 dBA	Add $2,000		
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000	✓	$6,000
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$54,000
Number of Benefited Residences			56
Total Unmodified Reasonableness Allowance			$3,024,000
* at Critical Design Receiver LT-1			

Worksheet C-11D

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-14, Area H, 12 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	75 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000		
75-78 dBA	Add $6,000	✓	$6,000
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	0 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3-7 dBA	Add $2,000		
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	15 dBA *		
Less than 6 dBA	Add $ 0		
6-8 dBA	Add $2,000		
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000	✓	$6,000
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$54,000
Number of Benefited Residences			56
Total Unmodified Reasonableness Allowance			$3,024,000
* at Critical Design Receiver LT-1			

Worksheet C-11E

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-14, Area H, 14 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	75 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000		
75-78 dBA	Add $6,000	✓	$6,000
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	0 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3-7 dBA	Add $2,000		
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	16 dBA *		
Less than 6 dBA	Add $ 0		
6-8 dBA	Add $2,000		
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000	✓	$6,000
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$54,000
Number of Benefited Residences			56
Total Unmodified Reasonableness Allowance			$3,024,000
* at Critical Design Receiver LT-1			

Worksheet C-11F

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-14, Area H, 16 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	75 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000		
75-78 dBA	Add $6,000	✓	$6,000
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	0 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3-7 dBA	Add $2,000		
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	17 dBA *		
Less than 6 dBA	Add $ 0		
6-8 dBA	Add $2,000		
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000	✓	$6,000
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$54,000
Number of Benefited Residences			56
Total Unmodified Reasonableness Allowance			$3,024,000
* at Critical Design Receiver LT-1			

Worksheet C-12A

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-15, Area H, 14 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	74 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000	✓	$4,000
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	0 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3-7 dBA	Add $2,000		
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	5 dBA *		
Less than 6 dBA	Add $ 0	✓	$0
6-8 dBA	Add $2,000		
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$46,000
Number of Benefited Residences			1
Total Unmodified Reasonableness Allowance			$46,000
* at Critical Design Receiver ST-2			

Worksheet C-12B

PROJECT: SR-91 Widening Project SR-55 to SR-241	PROJECT LOCATION: Orange County		Date: 05/08
NOISE BARRIER I.D. & LOCATION	NB-15, Area H, 16 feet high		
Base Allowance (2008 Dollars)			$32,000
1) Absolute Noise Levels	74 dBA*	Check	
69 dBA or less	Add $2,000		
70-74 dBA	Add $4,000	✓	$4,000
75-78 dBA	Add $6,000		
More than 78 dBA	Add $8,000		
2) "Build" VS Existing Noise Levels	0 dBA*	Check	
Less than 3 dBA	Add $ 0	✓	$0
3-7 dBA	Add $2,000		
8-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
3) Achievable Noise Reduction	5 dBA *		
Less than 6 dBA	Add $ 0	✓	$0
6-8 dBA	Add $2,000		
9-11 dBA	Add $4,000		
12 dBA or more	Add $6,000		
4) Either New Construction Or Pre-date 1978?			
YES on either one	Add $10,000	✓	$10,000
NO on both	Add $ 0		
Unmodified Reasonableness Allowance Per Residence			$46,000
Number of Benefited Residences			1
Total Unmodified Reasonableness Allowance			$46,000
* at Critical Design Receiver ST-2			

Appendix D Noise Barrier Analysis

Tables D-1 through D-15 summarize the pertinent information (existing, future with project noise levels future with barrier noise levels, number of residences or residential equivalents benefited, and predicted noise reduction, for each of the considered noise barriers.

Table D-1. Analysis of Barrier NB-1 & NB-1 EXT: Potentially Increase Existing 14' Noise Barrier and Add an Extension on East End, Area A

	Position																						Total Number of Benefited Receivers
	ST-26	**M-54**	**M-56**	**M-55**	**M-53**	**M-52**	**M-50**	**LT-8**	**M-51**	**M-48**	**M-47**	**LT-9**	**M-46**	**M-67**	**M-68**	**M-69**	**M-70**	**M-71**	**M-72**	**ST-27**	**M-65**	**M-66**	
Number of Units Represented	11	6	12	7	5	3	3	4	4	3	4	3	2	1	1	1	1	1	1	3	2	2	—
Existing Traffic Noise Level (dBA L_{eq}[h])	58	59	65	**67**	**66**	64	64	62	58	64	60	62	**66**	63	60	59	60	59	59	63	64	62	—
Future with Project Traffic Noise Level (dBA Leq[h])	58	59	65	**66**	**66**	64	64	62	58	64	60	63	**66**	63	61	60	61	60	59	63	65	63	—
Future with Project minus Existing Traffic Noise Level (dBA Leq[h])	0	0	0	-1	0	0	0	0	0	0	0	1	0	0	1	1	1	1	0	0	1	1	—
6-Foot Barrier																							
Future with Project Traffic Noise Level (dBA Leq[h])	—	—	—	—	—	—	—	—	—	—	60	61	65	63	61	60	60	60	59	62	65	63	—
Predicted Noise Reduction (dB)	—	—	—	—	—	—	—	—	—	—	0	2	1	0	0	0	1	0	0	1	0	0	—
Number of Benefited Receivers	—	—	—	—	—	—	—	—	—	—	0	0	0	0	0	0	0	0	0	0	0	0	0
8-Foot Barrier																							
Future with Project Traffic Noise Level (dBA Leq[h])	—	—	—	—	—	—	—	—	—	—	60	61	65	63	61	60	60	60	59	62	65	63	—
Predicted Noise Reduction (dB)	—	—	—	—	—	—	—	—	—	—	0	2	1	0	0	0	1	0	0	1	0	0	—
Number of Benefited Receivers	—	—	—	—	—	—	—	—	—	—	0	0	0	0	0	0	0	0	0	0	0	0	0
10-Foot Barrier																							
Future with Project Traffic Noise Level (dBA Leq[h])	—	—	—	—	—	—	—	—	—	—	60	61	63	63	61	60	60	60	59	62	65	63	—
Predicted Noise Reduction (dB)	—	—	—	—	—	—	—	—	—	—	0	2	3	0	0	0	1	0	0	1	0	0	—
Number of Benefited Receivers	—	—	—	—	—	—	—	—	—	—	0	0	0	0	0	0	0	0	0	0	0	0	0

Table D-1. Continued

	Position																						Total Number of Benefited Receivers
	ST-26	M-54	M-56	M-55	M-53	M-52	M-50	LT-8	M-51	M-48	M-47	LT-9	M-46	M-67	M-68	M-69	M-70	M-71	M-72	ST-27	M-65	M-66	
12-Foot Barrier[b]																							
Future with Project Traffic Noise Level (dBA Leq[h])	—	—	—	—	—	—	—	—	—	—	60	60	62	63	60	60	60	60	59	62	65	63	—
Predicted Noise Reduction (dB)	—	—	—	—	—	—	—	—	—	—	0	3	4	0	1	0	1	0	0	1	0	0	—
Number of Benefited Receivers	—	—	—	—	—	—	—	—	—	—	0	0	0	0	0	0	0	0	0	0	0	0	0
14-Foot Barrier																							
Future with Project Traffic Noise Level (dBA Leq[h])											59	60	61	63	60	60	60	60	59	62	65	62	—
Predicted Noise Reduction (dB)	—	—	—	—	—	—	—	—	—	—	1	3	5	0	1	0	1	0	0	1	0	1	—
Number of Benefited Receivers	—	—	—	—	—	—	—	—	—	—	0	0	2	0	0	0	0	0	0	0	0	0	2
16-Foot Barrier																							
Future with Project Traffic Noise Level (dBA Leq[h])	57	59	64	66	65	63	63	61	57	63	59	59	60	62	60	60	60	60	59	61	64	62	—
Predicted Noise Reduction (dB)	1	0	1	0	1	1	1	1	1	1	1	4	6	1	1	0	1	0	0	2	1	1	—
Number of Benefited Receivers	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2

[a] Traffic noise levels that approach or exceed 67 dBA L_{eq}(h) are shown in bold.
[b] Acoustically feasible barrier height (i.e., minimum of 5-dB insertion loss and breaks the line of sight to an 11.5-foot truck stack) highlighted in grey.

Table D-2. Analysis of Barrier NB-2A / NB-2B: Potentially Increase Heights of Existing 14' Edge-of-Shoulder and 10' Right-of-Way Barriers, Area C

	Position														Total Number of Benefited Receivers
	M-42	M-41	ST-22	LT-6	ST-24	M-35	M-40	M-39	M-38	ST-23	M-36	M-34	M-61	ST-25	
Number of Units Represented	20	5	5	6	6	12	4	3	4	3	3	4	1	3	—
Existing Traffic Noise Level (dBA L_{eq}[h])	57	61	60	**66**	58	58	58	59	60	59	59	61	65	55	—
Future with Project Traffic Noise Level (dBA Leq[h])	57	61	60	**66**	58	58	59	59	60	59	59	61	65	55	—
Future with Project minus Existing Traffic Noise Level (dBA Leq[h])	0	0	0	0	0	0	1	0	0	0	0	0	0	0	—
6-Foot Barrier															
Future with Project Traffic Noise Level (dBA Leq[h])	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Predicted Noise Reduction (dB)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Number of Benefited Receivers	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
8-Foot Barrier															
Future with Project Traffic Noise Level (dBA Leq[h])	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Predicted Noise Reduction (dB)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table D-2. Continued

	Position														Total Number of Benefited Receivers
	M-42	**M-41**	**ST-22**	**LT-6**	**ST-24**	**M-35**	**M-40**	**M-39**	**M-38**	**ST-23**	**M-36**	**M-34**	**M-61**	**ST-25**	
Number of Benefited Receivers	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
10-Foot Barrier															
Future with Project Traffic Noise Level (dBA Leq[h])	57	61	60	**66**	58	58	59	59	60	59	59	61	64	—	—
Predicted Noise Reduction (dB)	0	0	0	0	0	0	0	0	0	0	0	0	1	—	—
Number of Benefited Receivers	0	0	0	0	0	0	0	0	0	0	0	0	0	—	0
12-Foot Barrier[b]															
Future with Project Traffic Noise Level (dBA Leq[h])	57	60	59	**66**	58	58	58	58	60	59	59	61	64	—	—
Predicted Noise Reduction (dB)	0	1	1	0	0	0	1	1	0	0	0	0	1	—	—
Number of Benefited Receivers	0	0	0	0	0	0	0	0	0	0	0	0	0	—	0
14-Foot Barrier															
Future with Project Traffic Noise Level (dBA Leq[h])	56	59	58	**66**	58	58	57	57	60	59	59	61	64	—	—
Predicted Noise Reduction (dB)	1	2	2	0	0	0	2	2	0	0	0	0	1	—	—

Table D-2. Continued

	Position														Total Number of Benefited Receivers
	M-42	**M-41**	**ST-22**	**LT-6**	**ST-24**	**M-35**	**M-40**	**M-39**	**M-38**	**ST-23**	**M-36**	**M-34**	**M-61**	**ST-25**	
Number of Benefited Receivers	0	0	0	0	0	0	0	0	0	0	0	0	0	—	0
16-Foot Barrier															
Future with Project Traffic Noise Level (dBA Leq[h])	56	58	57	65	57	57	57	57	59	59	59	61	64	—	—
Predicted Noise Reduction (dB)	1	3	3	1	1	1	2	2	1	0	0	0	1	—	—
Number of Benefited Receivers	0	0	0	0	0	0	0	0	0	0	0	0	0	—	0

[a] Traffic noise levels that approach or exceed 67 dBA $L_{eq}(h)$ are shown in bold.

[b] Acoustically feasible barrier height (i.e., minimum of 5-dB insertion loss and breaks the line of sight to an 11.5-foot truck stack) highlighted in grey.

Table D-3. Analysis of Barrier NB-3: Potentially Increase Height of Existing 14' Right-of-Way Barrier, Area D

	Position																							Total Number of Benefited Receivers
	M-62	M-63	M-64	M-45	ST-20	ST-19	M-44	M-43	ST-21	M-37	ST-18	M-33	LT-7	M-32	M-31	M-30	M-29	M-28	M-27	ST-17	ST-16	M-59	M-60	M-26	
Number of Units Represented	2	1	1	5	5	7	4	3	7	4	11	9	4	6	13	7	6	7	5	14	6	1	1	12	—
Existing Traffic Noise Level (dBA L_{eq}[h])	63	**68**	62	65	**66**	60	64	60	65	61	**67**	**67**	**67**	**70**	**66**	**68**	64	63	**67**	63	60	62	62	60	—
Future with Project Traffic Noise Level (dBA Leq[h])	63	**69**	62	**66**	**67**	60	64	60	66	62	**67**	**68**	**68**	**71**	**66**	**69**	65	64	**68**	64	60	62	63	61	—
Future with Project minus Existing Traffic Noise Level (dBA Leq[h])	0	1	0	1	1	0	0	0	1	1	0	1	1	1	0	1	1	1	1	1	0	0	1	1	—
6-Foot Barrier																									
Future with Project Traffic Noise Level (dBA Leq[h])	63	67	62	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Predicted Noise Reduction (dB)	0	2	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Number of Benefited Receivers	0	0	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
8-Foot Barrier																									
Future with Project Traffic Noise Level (dBA Leq[h])	63	65	62	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Predicted Noise Reduction (dB)	0	4	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Number of Benefited Receivers	0	0	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
10-Foot Barrier																									
Future with Project Traffic Noise Level (dBA Leq[h])	63	64	62	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Predicted Noise Reduction (dB)	0	5	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Number of Benefited Receivers	0	1	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1

Table D-3. Continued

	Position																							Total Number of Benefited Receivers
	M-62	M-63	M-64	M-45	ST-20	ST-19	M-44	M-43	ST-21	M-37	ST-18	M-33	LT-7	M-32	M-31	M-30	M-29	M-28	M-27	ST-17	ST-16	M-59	M-60	M-26	
12-Foot Barrier[b]																									
Future with Project Traffic Noise Level (dBA Leq[h])	63	64	62	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Predicted Noise Reduction (dB)	0	5	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Number of Benefited Receivers	0	1	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
14-Foot Barrier																									
Future with Project Traffic Noise Level (dBA Leq[h])	63	64	62	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Predicted Noise Reduction (dB)	0	5	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Number of Benefited Receivers	0	1	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
16-Foot Barrier																									
Future with Project Traffic Noise Level (dBA Leq[h])	63	63	62	65	65	58	63	59	65	60	66	67	67	69	66	68	64	63	66	62	59	—	—	60	—
Predicted Noise Reduction (dB)	0	6	0	1	2	2	1	1	1	2	1	1	1	2	0	1	1	1	2	2	1	—	—	1	—
Number of Benefited Receivers	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	—	—	0	1

[a] Traffic noise levels that approach or exceed 67 dBA $L_{eq}(h)$ are shown in bold.
[b] Acoustically feasible barrier height (i.e., minimum of 5-dB insertion loss and breaks the line of sight to an 11.5-foot truck stack) highlighted in grey.

Table D-4. Analysis of Barrier NB-4: Potentially Construct New Edge-of-Shoulder Noise Barrier, Area F

	Position																							Total Number of Benefited Receivers
	ST-7	ST-8	M-24	ST-9	M-25	ST-10	M-23	LT-5	M-22	M-21	ST-12	M-20	M-19	M-18	ST-11	M-17	M-15	ST-14	ST-15	M-14	M-13	LT-3	ST-6	M-12	
Number of Units Represented	45	1	4	12	5	6	4	6	26	10	10	9	10	12	9	5	9	10	22	9	7	12	8	3	—
Existing Traffic Noise Level (dBA L_{eq}[h])	**73**	**68**	61	60	58	64	60	65	61	**67**	**68**	**73**	**68**	**70**	**67**	**68**	**70**	**69**	58	**68**	65	**66**	65	**67**	—
Future with Project Traffic Noise Level (dBA Leq[h])	**74**	**70**	62	61	59	**65**	**61**	66	63	**68**	**70**	**74**	**70**	**72**	**68**	**70**	**72**	**72**	59	**70**	**67**	**67**	**68**	**71**	—
Future with Project minus Existing Traffic Noise Level (dBA Leq[h])	1	2	1	1	1	1	1	1	2	1	2	1	2	2	1	2	2	3	1	2	2	1	3	4	—
6-Foot Barrier																									
Future with Project Traffic Noise Level (dBA Leq[h])	—	—	61	59	59	64	64	64	58	**66**	**67**	**72**	**68**	**69**	**67**	**68**	**71**	**69**	58	**68**	**66**	65	**68**	**67**	—
Predicted Noise Reduction (dB)	—	—	—	—	—	—	—	1	0	2	3	2	2	3	1	2	1	3	1	2	1	2	2	3	—
Number of Benefited Receivers	—	—	—	—	—	—	—	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8-Foot Barrier																									
Future with Project Traffic Noise Level (dBA Leq[h])	—	—	61	59	59	64	64	64	58	**66**	**67**	**72**	**68**	**69**	**67**	**68**	**71**	**69**	58	**68**	**66**	65	**66**	**67**	—
Predicted Noise Reduction (dB)	—	—	—	—	—	—	—	2	0	2	3	2	2	3	1	2	1	3	1	2	1	2	2	4	—
Number of Benefited Receivers	—	—	—	—	—	—	—	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10-Foot Barrier																									
Future with Project Traffic Noise Level (dBA Leq[h])	—	—	60	59	59	64	63	63	58	65	**66**	**71**	**66**	**68**	**66**	**67**	**70**	**72**	59	**70**	**67**	**67**	**68**	**71**	—
Predicted Noise Reduction (dB)	—	—	—	—	—	—	—	3	0	3	4	3	4	4	2	3	2	4	2	3	2	3	3	4	—
Number of Benefited Receivers	—	—	—	—	—	—	—	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table D-4. Continued

	Position																							Total Number of Benefited Receivers
	ST-7	ST-8	M-24	ST-9	M-25	ST-10	M-23	LT-5	M-22	M-21	ST-12	M-20	M-19	M-18	ST-11	M-17	M-15	ST-14	ST-15	M-14	M-13	LT-3	ST-6	M-12	
12-Foot Barrier[b]																									
Future with Project Traffic Noise Level (dBA Leq[h])	—	—	60	59	59	64	63	63	58	65	**66**	**71**	**66**	**68**	**66**	**67**	**70**	**68**	57	**67**	65	64	65	**67**	—
Predicted Noise Reduction (dB)	—	—	—	—	—	—	—	4	1	3	4	3	4	4	2	3	2	4	2	3	2	3	3	6	—
Number of Benefited Receivers	—	—	—	—	—	—	—	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3
14-Foot Barrier																									
Future with Project Traffic Noise Level (dBA Leq[h])	—	—	60	58	59	63	62	61	57	64	65	**69**	64	65	65	**66**	**69**	**67**	55	**66**	63	62	64	65	—
Predicted Noise Reduction (dB)	—	—	—	—	—	—	—	5	1	4	5	5	6	7	3	4	3	5	4	4	4	5	4	9	—
Number of Benefited Receivers	—	—	—	—	—	—	—	6	0	0	10	9	10	12	0	0	0	10	0	0	0	12	0	3	72
16-Foot Barrier																									
Future with Project Traffic Noise Level (dBA Leq[h])	—	—	59	58	58	62	61	61	57	63	64	**67**	63	64	62	63	**66**	65	57	63	61	60	61	62	—
Predicted Noise Reduction (dB)	—	—	—	—	—	—	—	5	1	5	6	7	7	8	6	7	6	7	2	7	6	7	7	10	—
Number of Benefited Receivers	—	—	—	—	—	—	—	6	0	10	10	9	10	12	9	5	9	10	0	9	7	12	8	3	**129**

[a] Traffic noise levels that approach or exceed 67 dBA L_{eq}(h) are shown in bold.
[b] Acoustically feasible barrier height (i.e., minimum of 5-dB insertion loss and breaks the line of sight to an 11.5-foot truck stack) highlighted in grey.

Table D-5. Analysis of Barrier NB-5: Potentially Construct New Right-of-Way Noise Barrier, Area F

	Position																							Total Number of Benefited Receivers
	ST-7	ST-8	M-24	ST-9	M-25	ST-10	M-23	LT-5	M-22	M-21	ST-12	M-20	M-19	M-18	ST-11	M-17	M-15	ST-14	ST-15	M-14	M-13	LT-3	ST-6	M-12	
Number of Units Represented	45	1	4	12	5	6	4	6	26	10	10	9	10	12	9	5	9	10	22	9	7	12	8	3	—
Existing Traffic Noise Level (dBA L_{eq}[h])	**73**	**68**	61	60	58	64	60	65	61	**67**	**68**	**73**	**68**	**70**	**67**	**68**	**70**	**69**	58	**68**	65	**66**	65	**67**	—
Future with Project Traffic Noise Level (dBA Leq[h])	**74**	**70**	62	61	59	**65**	**61**	66	63	**68**	**70**	**74**	**70**	**72**	**68**	**70**	**72**	**72**	59	**70**	**67**	**67**	**68**	**71**	—
Future with Project minus Existing Traffic Noise Level (dBA Leq[h])	1	2	1	1	1	1	1	1	2	1	2	1	2	2	1	2	2	3	1	2	2	1	3	4	—
6-Foot Barrier																									
Future with Project Traffic Noise Level (dBA Leq[h])	—	—	62	62	61	65	**66**	65	60	**68**	**70**	**74**	**70**	**72**	**68**	**69**	**72**	**70**	59	**69**	**67**	**67**	**66**	**68**	—
Predicted Noise Reduction (dB)	—	—	0	—	—	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	—
Number of Benefited Receivers	—	—	0	—	—	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8-Foot Barrier																									
Future with Project Traffic Noise Level (dBA Leq[h])	—	—	62	62	60	65	65	65	59	**68**	**69**	**73**	**69**	**70**	**68**	**69**	**71**	**68**	58	**69**	**67**	**67**	**66**	**68**	—
Predicted Noise Reduction (dB)	—	—	0	—	—	1	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	1	3	—
Number of Benefited Receivers	—	—	0	—	—	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10-Foot Barrier																									
Future with Project Traffic Noise Level (dBA Leq[h])	—	—	62	62	60	65	65	64	59	**68**	**66**	**71**	**66**	**67**	**67**	**68**	**71**	**66**	58	**67**	**66**	**66**	64	**66**	—
Predicted Noise Reduction (dB)	—	—	0	—	—	1	1	1	2	0	0	2	0	0	0	0	0	2	0	0	0	1	5	2	—
Number of Benefited Receivers	—	—	0	—	—	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	8

Table D-5. Continued

	Position																							Total Number of Benefited Receivers
	ST-7	ST-8	M-24	ST-9	M-25	ST-10	M-23	LT-5	M-22	M-21	ST-12	M-20	M-19	M-18	ST-11	M-17	M-15	ST-14	ST-15	M-14	M-13	LT-3	ST-6	M-12	
12-Foot Barrier[b]																									
Future with Project Traffic Noise Level (dBA Leq[h])	—	—	62	62	60	65	65	63	59	**67**	**67**	**69**	64	65	64	65	**70**	**66**	58	65	63	62	61	63	—
Predicted Noise Reduction (dB)	—	—	0	—	—	1	1	1	2	0	1	4	0	0	0	0	0	2	0	0	0	1	5	3	—
Number of Benefited Receivers	—	—	0	—	—	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	8
14-Foot Barrier																									
Future with Project Traffic Noise Level (dBA Leq[h])	—	—	62	61	60	64	64	62	59	64	**66**	**68**	63	**68**	62	64	**67**	**67**	58	63	61	61	61	**66**	—
Predicted Noise Reduction (dB)	—	—	0	—	—	2	2	2	2	2	3	5	0	0	0	1	1	3	1	1	1	3	6	4	—
Number of Benefited Receivers	—	—	0	—	—	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	8	0	17
16-Foot Barrier																									
Future with Project Traffic Noise Level (dBA Leq[h])	—	—	62	61	60	63	62	61	59	63	65	**67**	**66**	**67**	62	**66**	65	**67**	59	63	60	64	63	65	—
Predicted Noise Reduction (dB)	—	—	0	—	—	2	3	3	3	4	4	7	0	0	1	6	1	5	2	3	3	6	5	5	—
Number of Benefited Receivers	—	—	0	—	—	0	0	0	0	0	0	9	0	0	0	5	0	10	0	0	0	12	8	3	47

[a] Traffic noise levels that approach or exceed 67 dBA $L_{eq}(h)$ are shown in bold.
[b] Acoustically feasible barrier height (i.e., minimum of 5-dB insertion loss and breaks the line of sight to an 11.5-foot truck stack) highlighted in grey.

Table D-6. Analysis of Barrier NB-6: Potentially Construct New Noise Barrier at Residential Property Line, Area F

	Position																	Total Number of Benefited Receivers
	LT-5	M-22	M-21	ST-12	M-20	M-19	M-18	ST-11	M-17	M-15	ST-14	ST-15	M-14	M-13	LT-3	ST-6	M-12	
Number of Units Represented	6	26	10	10	9	10	12	9	5	9	10	22	9	7	12	8	3	—
Existing Traffic Noise Level (dBA L_{eq}[h])	65	61	**67**	**68**	**73**	**68**	**70**	**67**	**68**	**70**	**69**	58	**68**	65	**66**	65	**67**	—
Future with Project Traffic Noise Level (dBA Leq[h])	66	63	**68**	**70**	**74**	**70**	**72**	**68**	**70**	**72**	**72**	59	**70**	**67**	**67**	**68**	**71**	—
Future with Project minus Existing Traffic Noise Level (dBA Leq[h])	1	2	1	2	1	2	2	1	2	2	3	1	2	2	1	3	4	—
6-Foot Barrier																		
Future with Project Traffic Noise Level (dBA Leq[h])	65	59	**68**	**70**	**75**	**70**	**72**	**68**	**70**	**71**	**71**	59	**69**	**67**	**67**	**66**	**68**	—
Predicted Noise Reduction (dB)	0	2	0	0	0	0	0	0	0	1	1	0	1	0	0	2	3	—
Number of Benefited Receivers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8-Foot Barrier																		
Future with Project Traffic Noise Level (dBA Leq[h])	63	59	**66**	**68**	**71**	**68**	**70**	**67**	**68**	**70**	**70**	59	**69**	**66**	**66**	**66**	**67**	—
Predicted Noise Reduction (dB)	2	2	2	2	3	2	2	1	2	2	2	0	1	1	1	2	4	—
Number of Benefited Receivers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10-Foot Barrier																		
Future with Project Traffic Noise Level (dBA Leq[h])	61	59	65	**67**	**69**	**67**	**68**	**67**	**68**	**69**	**69**	58	**68**	65	65	65	**66**	—
Predicted Noise Reduction (dB)	4	2	3	3	5	3	4	1	2	3	3	1	2	2	2	3	5	—
Number of Benefited Receivers	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	3	12
12-Foot Barrier																		
Future with Project Traffic Noise Level (dBA Leq[h])	61	58	64	**66**	**68**	**66**	**67**	**66**	**67**	**68**	**68**	58	**67**	64	65	64	65	—
Predicted Noise Reduction (dB)	4	3	4	4	6	4	5	2	3	4	4	1	3	3	2	4	6	—
Number of Benefited Receivers	0	0	0	0	9	0	12	0	0	0	0	0	0	0	0	0	3	24

Table D-6. Continued

	Position																	Total Number of Benefited Receivers
	LT-5	M-22	M-21	ST-12	M-20	M-19	M-18	ST-11	M-17	M-15	ST-14	ST-15	M-14	M-13	LT-3	ST-6	M-12	
14-Foot Barrier																		
Future with Project Traffic Noise Level (dBA Leq[h])	61	58	64	**66**	**68**	**65**	**66**	65	**66**	**67**	**68**	58	**67**	63	64	64	64	—
Predicted Noise Reduction (dB)	4	3	4	4	6	5	6	3	4	5	4	1	3	4	3	4	7	—
Number of Benefited Receivers	0	0	0	0	9	10	12	0	0	9	0	0	0	0	0	0	3	43
16-Foot Barrier																		
Future with Project Traffic Noise Level (dBA Leq[h])	60	58	63	**66**	**67**	64	65	65	65	**67**	**67**	57	**66**	63	63	63	64	—
Predicted Noise Reduction (dB)	5	3	5	4	7	6	7	3	5	5	5	2	4	4	4	5	7	—
Number of Benefited Receivers	6	0	10	0	9	10	12	0	5	9	10	0	0	0	0	8	3	82

Table D-7. Analysis of Barrier NB-7: Potentially Construct New Noise Barrier 10' Inside Department Right-of-Way, Area F

	Position																	Total Number of Benefited Receivers
	LT-5	M-22	M-21	ST-12	M-20	M-19	M-18	ST-11	M-17	M-15	ST-14	ST-15	M-14	M-13	LT-3	ST-6	M-12	
Number of Units Represented	6	26	10	10	9	10	12	9	5	9	10	22	9	7	12	8	3	—
Existing Traffic Noise Level (dBA L_{eq}[h])	65	61	67	68	73	68	70	67	68	70	69	58	68	65	66	65	67	—
Future with Project Traffic Noise Level (dBA Leq[h])	66	63	68	70	74	70	72	68	70	72	72	59	70	67	67	68	71	—
Future with Project minus Existing Traffic Noise Level (dBA Leq[h])	1	2	1	2	1	2	2	1	2	2	3	1	2	2	1	3	4	—
6-Foot Barrier																		
Future with Project Traffic Noise Level (dBA Leq[h])	65	60	68	70	74	70	71	68	69	72	70	59	69	67	67	66	68	—
Predicted Noise Reduction (dB)	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	—
Number of Benefited Receivers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8-Foot Barrier																		
Future with Project Traffic Noise Level (dBA Leq[h])	65	59	68	68	73	69	69	67	69	71	68	58	68	67	67	65	67	—
Predicted Noise Reduction (dB)	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	1	2	—
Number of Benefited Receivers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10-Foot Barrier																		
Future with Project Traffic Noise Level (dBA Leq[h])	64	59	67	67	69	64	65	64	65	69	65	58	64	64	62	61	62	—
Predicted Noise Reduction (dB)	1	2	0	0	2	0	0	0	0	0	2	0	0	0	1	5	4	—
Number of Benefited Receivers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	8
12-Foot Barrier[b]																		
Future with Project Traffic Noise Level (dBA Leq[h])	64	59	67	67	69	64	65	64	65	69	65	58	64	64	62	61	62	—
Predicted Noise Reduction (dB)	1	2	0	1	4	0	0	0	0	0	2	0	0	0	1	5	4	—
Number of Benefited Receivers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	8

Table D-7. Continued

	Position																	Total Number of Benefited Receivers
	LT-5	M-22	M-21	ST-12	M-20	M-19	M-18	ST-11	M-17	M-15	ST-14	ST-15	M-14	M-13	LT-3	ST-6	M-12	
14-Foot Barrier																		
Future with Project Traffic Noise Level (dBA Leq[h])	63	60	65	66	68	63	65	62	63	66	65	58	63	62	61	60	61	—
Predicted Noise Reduction (dB)	2	2	2	3	5	0	0	0	1	1	3	1	1	1	3	6	4	—
Number of Benefited Receivers	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	8	0	17
16-Foot Barrier																		
Future with Project Traffic Noise Level (dBA Leq[h])	63	59	63	65	67	63	67	62	63	65	66	58	63	60	62	60	62	—
Predicted Noise Reduction (dB)	3	3	4	4	7	0	0	1	3	1	5	2	3	3	6	5	5	—
Number of Benefited Receivers	0	0	0	0	9	0	0	0	0	0	10	0	0	0	12	8	3	42

[a] Traffic noise levels that approach or exceed 67 dBA $L_{eq}(h)$ are shown in bold.
[b] Acoustically feasible barrier height (i.e., minimum of 5-dB insertion loss and breaks the line of sight to an 11.5-foot truck stack) highlighted in grey.

Table D-8. Analysis of Barrier NB-8: Potentially Construct New Noise Barrier at Department Right-of-Way, Base Elevation Equivalent to Existing Top-of-Berm Height, Area F

	Position																	Total Number of Benefited Receivers
	LT-5	M-22	M-21	ST-12	M-20	M-19	M-18	ST-11	M-17	M-15	ST-14	ST-15	M-14	M-13	LT-3	ST-6	M-12	
Number of Units Represented	6	26	10	10	9	10	12	9	5	9	10	22	9	7	12	8	3	—
Existing Traffic Noise Level (dBA L_{eq}[h])	65	61	**67**	**68**	**73**	**68**	**70**	**67**	**68**	**70**	**69**	58	**68**	65	**66**	65	**67**	—
Future with Project Traffic Noise Level (dBA Leq[h])	66	63	**68**	**70**	**74**	**70**	**72**	**68**	**70**	**72**	**72**	59	**70**	**67**	**67**	**68**	**71**	—
Future with Project minus Existing Traffic Noise Level (dBA Leq[h])	1	2	1	2	1	2	2	1	2	2	3	1	2	2	1	3	4	—
6-Foot Barrier																		
Future with Project Traffic Noise Level (dBA Leq[h])	64	59	**66**	**67**	**73**	**66**	**68**	63	**67**	**67**	**67**	56	65	62	63	61	62	—
Predicted Noise Reduction (dB)	2	3	2	3	1	3	6	5	6	6	7	2	5	3	5	4	4	—
Number of Benefited Receivers	0	0	0	0	0	0	12	9	5	9	10	0	9	0	12	0	0	66
8-Foot Barrier																		
Future with Project Traffic Noise Level (dBA Leq[h])	63	59	64	**69**	**72**	64	**66**	62	64	65	65	58	63	61	61	60	62	—
Predicted Noise Reduction (dB)	3	3	4	2	3	6	7	6	7	7	7	1	7	6	6	6	2	—
Number of Benefited Receivers	0	0	0	0	0	10	12	9	5	9	10	0	9	7	12	8	0	91
10-Foot Barrier																		
Future with Project Traffic Noise Level (dBA Leq[h])	62	59	63	**68**	**70**	63	**69**	62	64	65	65	58	63	60	61	60	**66**	—
Predicted Noise Reduction (dB)	4	3	5	3	5	7	4	6	4	7	5	1	7	7	3	2	3	—
Number of Benefited Receivers	0	0	10	0	9	10	0	9	0	9	10	0	9	7	0	0	0	73
12-Foot Barrier[b]																		
Future with Project Traffic Noise Level (dBA Leq[h])	61	59	65	**67**	**69**	**67**	**69**	62	**67**	**69**	**69**	58	63	59	65	65	**66**	—
Predicted Noise Reduction (dB)	4	3	4	4	6	5	5	3	4	5	5	2	8	8	3	3	4	—
Number of Benefited Receivers	0	0	0	0	9	10	12	0	0	9	10	0	9	7	0	0	0	66

Table D-8. Continued

	Position																	Total Number of Benefited Receivers
	LT-5	M-22	M-21	ST-12	M-20	M-19	M-18	ST-11	M-17	M-15	ST-14	ST-15	M-14	M-13	LT-3	ST-6	M-12	
14-Foot Barrier																		
Future with Project Traffic Noise Level (dBA Leq[h])	61	58	65	**66**	**68**	**67**	**68**	**66**	**67**	**68**	**68**	57	62	60	65	64	65	—
Predicted Noise Reduction (dB)	5	4	4	5	7	5	6	4	5	5	6	2	7	7	4	4	5	—
Number of Benefited Receivers	6	0	0	10	9	10	12	0	5	9	10	0	9	7	0	0	3	90
16-Foot Barrier																		
Future with Project Traffic Noise Level (dBA Leq[h])	61	58	65	65	**67**	**66**	**67**	65	**66**	**68**	**67**	57	**67**	64	64	64	65	—
Predicted Noise Reduction (dB)	6	1	8	12	12	1	8	0	4	6	6	2	5	5	5	5	6	—
Number of Benefited Receivers	6	0	10	10	9	0	12	0	0	9	10	0	9	7	12	8	3	105

[a] Traffic noise levels that approach or exceed 67 dBA L_{eq}(h) are shown in bold.

[b] Acoustically feasible barrier height (i.e., minimum of 5-dB insertion loss and breaks the line of sight to an 11.5-foot truck stack) highlighted in grey.

Table D-9. Analysis of Barrier NB-9A / NB-9B: Potentially Construct New Noise Barrier at Edge-of-Shoulder (NB-9A) and Increase Existing 12' High Edge-of-Shoulder Noise Barrier (NB-9B), Area G

	Position					Total Number of Benefited Receivers
	ST-3	LT-2	M-2	ST-1	M-1	
Number of Units Represented	40	9	2	1	3	—
Existing Traffic Noise Level (dBA L_{eq}[h])	69	70	66	68	69	—
Future with Project Traffic Noise Level (dBA Leq[h])	69	70	66	68	69	—
Future with Project minus Existing Traffic Noise Level (dBA Leq[h])	0	0	0	0	0	—
6-Foot Barrier						
Future with Project Traffic Noise Level (dBA Leq[h])	—	69	66	68	69	—
Predicted Noise Reduction (dB)	—	1	0	0	0	—
Number of Benefited Receivers	—	0	0	0	0	0
8-Foot Barrier						
Future with Project Traffic Noise Level (dBA Leq[h])	—	68	66	68	69	—
Predicted Noise Reduction (dB)	—	2	0	0	0	—
Number of Benefited Receivers	—	0	0	0	0	0
10-Foot Barrier						
Future with Project Traffic Noise Level (dBA Leq[h])	—	67	66	68	69	—
Predicted Noise Reduction (dB)	—	3	0	0	0	—
Number of Benefited Receivers	—	0	0	0	0	0
12-Foot Barrier[b]						
Future with Project Traffic Noise Level (dBA Leq[h])	—	67	66	68	69	—
Predicted Noise Reduction (dB)	—	3	0	0	0	—
Number of Benefited Receivers	—	0	0	0	0	0

Table D-9. Continued

	Position					Total Number of Benefited Receivers
	ST-3	**LT-2**	**M-2**	**ST-1**	**M-1**	
14-Foot Barrier						
Future with Project Traffic Noise Level (dBA Leq[h])	—	66	65	67	69	—
Predicted Noise Reduction (dB)	—	4	1	1	0	—
Number of Benefited Receivers	—	0	0	0	0	0
16-Foot Barrier						
Future with Project Traffic Noise Level (dBA Leq[h])	—	66	65	67	69	—
Predicted Noise Reduction (dB)	—	4	1	1	0	—
Number of Benefited Receivers	—	0	0	0	0	0

[a] Traffic noise levels that approach or exceed 67 dBA $L_{eq}(h)$ are shown in bold.

[b] Acoustically feasible barrier height (i.e., minimum of 5-dB insertion loss and breaks the line of sight to an 11.5-foot truck stack) highlighted in grey.

Table D-10. Analysis of Barrier NB-10: Potentially Construct New Noise Barrier at Edge-of-Shoulder, Area H

	Position													Total Number of Benefited Receivers
	M-11	**M-10**	**M-9**	**M-8**	**ST-4**	**M-58**	**M-7**	**M-6**	**M-5**	**M-4**	**LT-1**	**M-3**	**M-57**	
Number of Units Represented	3	3	11	3	4	4	20	24	8	8	12	8	12	—
Existing Traffic Noise Level (dBA Leq[h])	62	61	59	65	64	74	74	68	75	62	75	63	73	—
Future with Project Traffic Noise Level (dBA Leq[h])	62	61	59	65	64	74	74	68	75	62	75	63	73	—
Future with Project minus Existing Traffic Noise Level (dBA Leq[h])	0	0	0	0	0	0	0	0	0	0	0	0	0	—
6-Foot Barrier														
Future with Project Traffic Noise Level (dBA Leq[h])	—	—	—	—	63	72	**72**	**66**	**74**	61	**75**	63	73	—
Predicted Noise Reduction (dB)	—	—	—	—	1	2	2	2	1	1	0	0	0	—
Number of Benefited Receivers	—	—	—	3	0	0	0	0	0	0	0	0	0	0
8-Foot Barrier														
Future with Project Traffic Noise Level (dBA Leq[h])	—	—	—	—	63	71	**71**	**66**	**73**	61	**74**	63	73	—
Predicted Noise Reduction (dB)	—	—	—	—	1	3	3	2	2	1	1	0	0	—
Number of Benefited Receivers	—	—	—	—	0	0	0	0	0	0	0	0	0	0

Table D-10. Continued

	Position													Total Number of Benefited Receivers
	M-11	M-10	M-9	M-8	ST-4	M-58	M-7	M-6	M-5	M-4	LT-1	M-3	M-57	
10-Foot Barrier														
Future with Project Traffic Noise Level (dBA Leq[h])	—	—	—	—	63	70	**70**	65	**72**	60	**74**	62	72	—
Predicted Noise Reduction (dB)	—	—	—	—	1	4	4	3	3	2	1	1	1	—
Number of Benefited Receivers	—	—	—	—	0	0	0	0	0	0	0	0	0	0
12-Foot Barrier														
Future with Project Traffic Noise Level (dBA Leq[h])	—	—	—	—	62	68	**69**	64	**72**	60	**73**	62	72	—
Predicted Noise Reduction (dB)	—	—	—	—	2	6	5	4	3	2	2	1	1	—
Number of Benefited Receivers	—	—	—	—	0	4	20	0	0	0	0	0	0	24
14-Foot Barrier														
Future with Project Traffic Noise Level (dBA Leq[h])	—	—	—	—	60	67	**67**	62	**71**	59	**72**	62	71	—
Predicted Noise Reduction (dB)	—	—	—	—	4	7	7	6	4	3	3	1	2	—
Number of Benefited Receivers	—	—	—	—	0	4	20	24	0	0	0	0	0	48
16-Foot Barrier														
Future with Project Traffic Noise Level (dBA Leq[h])	—	—	—	—	60	66	**66**	61	**69**	58	**71**	62	71	—

Table D-10. Continued

	Position													Total Number of Benefited Receivers
	M-11	**M-10**	**M-9**	**M-8**	**ST-4**	**M-58**	**M-7**	**M-6**	**M-5**	**M-4**	**LT-1**	**M-3**	**M-57**	
Predicted Noise Reduction (dB)	—	—	—	—	4	8	8	7	6	4	4	1	2	—
Number of Benefited Receivers	—	—	—	—	0	4	20	24	8	0	0	0	0	56

[a] Traffic noise levels that approach or exceed 67 dBA Leq(h) are shown in bold.

[b] Acoustically feasible barrier height (i.e., minimum of 5-dB insertion loss and breaks the line of sight to an 11.5-foot truck stack) highlighted in grey.

Table D-11. Analysis of Barrier NB-11: Potentially Construct New Noise Barrier at Edge-of-Shoulder, Area H

	Position	Total Number of Benefited Receivers
	ST-2	
Number of Units Represented	1	—
Existing Traffic Noise Level (dBA L_{eq}[h])	74	—
Future with Project Traffic Noise Level (dBA Leq[h])	74	—
Future with Project minus Existing Traffic Noise Level (dBA Leq[h])	0	—
6-Foot Barrier		
Future with Project Traffic Noise Level (dBA Leq[h])	**69**	—
Predicted Noise Reduction (dB)	5	—
Number of Benefited Receivers	1	1
8-Foot Barrier		
Future with Project Traffic Noise Level (dBA Leq[h])	**68**	—
Predicted Noise Reduction (dB)	6	—
Number of Benefited Receivers	1	1
10-Foot Barrier		
Future with Project Traffic Noise Level (dBA Leq[h])	**68**	—
Predicted Noise Reduction (dB)	6	—
Number of Benefited Receivers	1	1
12-Foot Barrier[b]		
Future with Project Traffic Noise Level (dBA Leq[h])	**66**	—
Predicted Noise Reduction (dB)	8	—
Number of Benefited Receivers	1	1

Table D-11. Continued

	Position	Total Number of Benefited Receivers
	ST-2	
14-Foot Barrier		
Future with Project Traffic Noise Level (dBA Leq[h])	65	—
Predicted Noise Reduction (dB)	9	—
Number of Benefited Receivers	1	1
16-Foot Barrier		
Future with Project Traffic Noise Level (dBA Leq[h])	65	—
Predicted Noise Reduction (dB)	9	—
Number of Benefited Receivers	1	1

[a] Traffic noise levels that approach or exceed 67 dBA $L_{eq}(h)$ are shown in bold.

[b] Acoustically feasible barrier height (i.e., minimum of 5-dB insertion loss and breaks the line of sight to an 11.5-foot truck stack) highlighted in grey.

Table D-12. Analysis of Barrier NB-12: Potentially Construct Noise Barrier at Right-of-Way, Area H

	Position													Total Number of Benefited Receivers
	M-11	**M-10**	**M-9**	**M-8**	**ST-4**	**M-58**	**M-7**	**M-6**	**M-5**	**M-4**	**LT-1**	**M-3**	**M-57**	
Number of Units Represented	3	3	11	3	4	4	20	24	8	8	12	8	12	—
Existing Traffic Noise Level (dBA L_{eq}[h])	62	61	59	65	64	74	74	68	75	62	75	63	73	—
Future with Project Traffic Noise Level (dBA Leq[h])	62	61	59	65	64	74	74	68	75	62	75	63	73	—
Future with Project minus Existing Traffic Noise Level (dBA Leq[h])	0	0	0	0	0	0	0	0	0	0	0	0	0	—
6-Foot Barrier														
Future with Project Traffic Noise Level (dBA Leq[h])	—	—	—	64	63	73	**74**	**68**	**75**	62	**75**	63	73	—
Predicted Noise Reduction (dB)	—	—	—	1	1	1	0	0	0	0	0	0	0	—
Number of Benefited Receivers	—	—	—	0	0	0	0	0	0	0	0	0	0	0
8-Foot Barrier														
Future with Project Traffic Noise Level (dBA Leq[h])	—	—	—	64	62	73	**74**	**68**	**75**	62	**75**	63	73	—
Predicted Noise Reduction (dB)	—	—	—	1	2	1	0	0	0	0	0	0	0	—

Table D-12. Continued

	Position													Total Number of Benefited Receivers
	M-11	M-10	M-9	M-8	ST-4	M-58	M-7	M-6	M-5	M-4	LT-1	M-3	M-57	
Number of Benefited Receivers	—	—	—	0	0	0	0	0	0	0	0	0	0	0
10-Foot Barrier														
Future with Project Traffic Noise Level (dBA Leq[h])	—	—	—	63	62	72	**74**	**67**	**74**	61	**75**	63	73	—
Predicted Noise Reduction (dB)	—	—	—	2	2	2	0	1	1	1	0	0	0	—
Number of Benefited Receivers	—	—	—	0	0	0	0	0	0	0	0	0	0	0
12-Foot Barrier[b]														
Future with Project Traffic Noise Level (dBA Leq[h])	—	—	—	63	61	71	**73**	**66**	**74**	61	**74**	63	73	—
Predicted Noise Reduction (dB)	—	—	—	2	3	3	1	2	1	1	1	0	0	—
Number of Benefited Receivers	—	—	—	0	0	0	0	0	0	0	0	0	0	0
14-Foot Barrier														
Future with Project Traffic Noise Level (dBA Leq[h])	—	—	—	62	61	70	**72**	**66**	**73**	61	**73**	62	72	—
Predicted Noise Reduction (dB)	—	—	—	3	3	4	2	2	2	1	2	1	1	—

Table D-12. Continued

	Position													Total Number of Benefited Receivers
	M-11	**M-10**	**M-9**	**M-8**	**ST-4**	**M-58**	**M-7**	**M-6**	**M-5**	**M-4**	**LT-1**	**M-3**	**M-57**	
Number of Benefited Receivers	—	—	—	0	0	0	0	0	0	0	0	0	0	0
16-Foot Barrier														
Future with Project Traffic Noise Level (dBA Leq[h])	—	—	—	62	60	69	**71**	65	**72**	60	**73**	62	71	—
Predicted Noise Reduction (dB)	—	—	—	3	4	5	3	3	3	2	2	1	2	—
Number of Benefited Receivers	—	—	—	0	0	4	0	0	0	0	0	0	0	4

[a] Traffic noise levels that approach or exceed 67 dBA $L_{eq}(h)$ are shown in bold.

[b] Acoustically feasible barrier height (i.e., minimum of 5-dB insertion loss and breaks the line of sight to an 11.5-foot truck stack) highlighted in grey.

Table D-13. Analysis of Barrier NB-13: Potentially Construct Noise Barrier at Right-of-Way, Area H

	Position	Total Number of Benefited Receivers
	ST-2	
Number of Units Represented	1	—
Existing Traffic Noise Level (dBA L_{eq}[h])	74	—
Future with Project Traffic Noise Level (dBA Leq[h])	74	—
Future with Project minus Existing Traffic Noise Level (dBA Leq[h])	0	—
6-Foot Barrier		
Future with Project Traffic Noise Level (dBA Leq[h])	**69**	—
Predicted Noise Reduction (dB)	5	—
Number of Benefited Receivers	1	1
8-Foot Barrier		
Future with Project Traffic Noise Level (dBA Leq[h])	**69**	—
Predicted Noise Reduction (dB)	5	—
Number of Benefited Receivers	1	1
10-Foot Barrier		
Future with Project Traffic Noise Level (dBA Leq[h])	**67**	—
Predicted Noise Reduction (dB)	7	—
Number of Benefited Receivers	1	1

Table D-13. Continued

	Position	Total Number of Benefited Receivers
	ST-2	
12-Foot Barrier[b]		
Future with Project Traffic Noise Level (dBA Leq[h])	**67**	—
Predicted Noise Reduction (dB)	7	—
Number of Benefited Receivers	1	1
14-Foot Barrier		
Future with Project Traffic Noise Level (dBA Leq[h])	**66**	—
Predicted Noise Reduction (dB)	8	—
Number of Benefited Receivers	1	1
16-Foot Barrier		
Future with Project Traffic Noise Level (dBA Leq[h])	65	—
Predicted Noise Reduction (dB)	9	—
Number of Benefited Receivers	1	1

[a] Traffic noise levels that approach or exceed 67 dBA $L_{eq}(h)$ are shown in bold.
[b] Acoustically feasible barrier height (i.e., minimum of 5-dB insertion loss and breaks the line of sight to an 11.5-foot truck stack) highlighted in grey.

Table D-14. Analysis of Barrier NB-14: Potentially Construct Noise Barrier at Residential Property Line, Area H

	Position								Total Number of Benefited Receivers
	M-58	M-7	M-6	M-5	M-4	LT-1	M-3	M-57	
Number of Units Represented	4	20	24	8	8	12	8	12	—
Existing Traffic Noise Level (dBA L_{eq}[h])	74	74	68	75	62	75	63	73	—
Future with Project Traffic Noise Level (dBA Leq[h])	74	74	68	75	62	75	63	73	—
Future with Project minus Existing Traffic Noise Level (dBA Leq[h])	0	0	0	0	0	0	0	0	—
6-Foot Barrier									
Future with Project Traffic Noise Level (dBA Leq[h])	**68**	**67**	**67**	**68**	61	65	62	66	—
Predicted Noise Reduction (dB)	6	7	1	7	1	10	1	7	—
Number of Benefited Receivers	4	20	0	8	0	12	0	12	56
8-Foot Barrier									
Future with Project Traffic Noise Level (dBA Leq[h])	67	65	**67**	65	60	63	62	63	—
Predicted Noise Reduction (dB)	7	9	1	10	2	12	1	10	—
Number of Benefited Receivers	4	20	0	8	0	12	0	12	56
10-Foot Barrier									
Future with Project Traffic Noise Level (dBA Leq[h])	66	64	**67**	63	60	61	62	61	—
Predicted Noise Reduction (dB)	8	10	1	12	2	14	1	12	—
Number of Benefited Receivers	4	20	0	8	0	12	0	12	56

Table D-14. Continued

	Position								Total Number of Benefited Receivers
	M-58	**M-7**	**M-6**	**M-5**	**M-4**	**LT-1**	**M-3**	**M-57**	
12-Foot Barrier[b]									
Future with Project Traffic Noise Level (dBA Leq[h])	65	62	**67**	61	59	60	61	60	—
Predicted Noise Reduction (dB)	9	12	1	14	3	15	2	13	—
Number of Benefited Receivers	4	20	0	8	0	12	0	12	56
14-Foot Barrier									
Future with Project Traffic Noise Level (dBA Leq[h])	64	62	**67**	60	59	59	61	58	—
Predicted Noise Reduction (dB)	10	12	1	15	3	16	2	15	—
Number of Benefited Receivers	4	20	0	8	0	12	0	12	56
16-Foot Barrier									
Future with Project Traffic Noise Level (dBA Leq[h])	64	61	**67**	59	58	58	61	57	—
Predicted Noise Reduction (dB)	10	13	1	16	4	17	2	16	—
Number of Benefited Receivers	4	20	0	8	0	12	0	12	56

[a] Traffic noise levels that approach or exceed 67 dBA $L_{eq}(h)$ are shown in bold.

[b] Acoustically feasible barrier height (i.e., minimum of 5-dB insertion loss and breaks the line of sight to an 11.5-foot truck stack) highlighted in grey.

Table D-15. Analysis of Barrier NB-15: Potentially Construct Noise Barrier at Residential Property Line, Area H

	Position	Total Number of Benefited Receivers
	ST-2	
Number of Units Represented	1	—
Existing Traffic Noise Level (dBA L_{eq}[h])	74	—
Future with Project Traffic Noise Level (dBA Leq[h])	74	—
Future with Project minus Existing Traffic Noise Level (dBA Leq[h])	0	—
6-Foot Barrier		
Future with Project Traffic Noise Level (dBA Leq[h])	**73**	—
Predicted Noise Reduction (dB)	1	—
Number of Benefited Receivers	0	0
8-Foot Barrier		
Future with Project Traffic Noise Level (dBA Leq[h])	**71**	—
Predicted Noise Reduction (dB)	3	—
Number of Benefited Receivers	0	0
10-Foot Barrier		
Future with Project Traffic Noise Level (dBA Leq[h])	**71**	—
Predicted Noise Reduction (dB)	3	—
Number of Benefited Receivers	0	0

Table D-15. Continued

	Position	Total Number of Benefited Receivers
	ST-2	
12-Foot Barrier[b]		
Future with Project Traffic Noise Level (dBA Leq[h])	**70**	—
Predicted Noise Reduction (dB)	4	—
Number of Benefited Receivers	0	0
14-Foot Barrier		
Future with Project Traffic Noise Level (dBA Leq[h])	**69**	—
Predicted Noise Reduction (dB)	5	—
Number of Benefited Receivers	1	1
16-Foot Barrier		
Future with Project Traffic Noise Level (dBA Leq[h])	**69**	—
Predicted Noise Reduction (dB)	5	—
Number of Benefited Receivers	1	1
[a] Traffic noise levels that approach or exceed 67 dBA $L_{eq}(h)$ are shown in bold.		
[b] Acoustically feasible barrier height (i.e., minimum of 5-dB insertion loss and breaks the line of sight to an 11.5-foot truck stack) highlighted in grey.		

Appendix E Supplemental Data

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